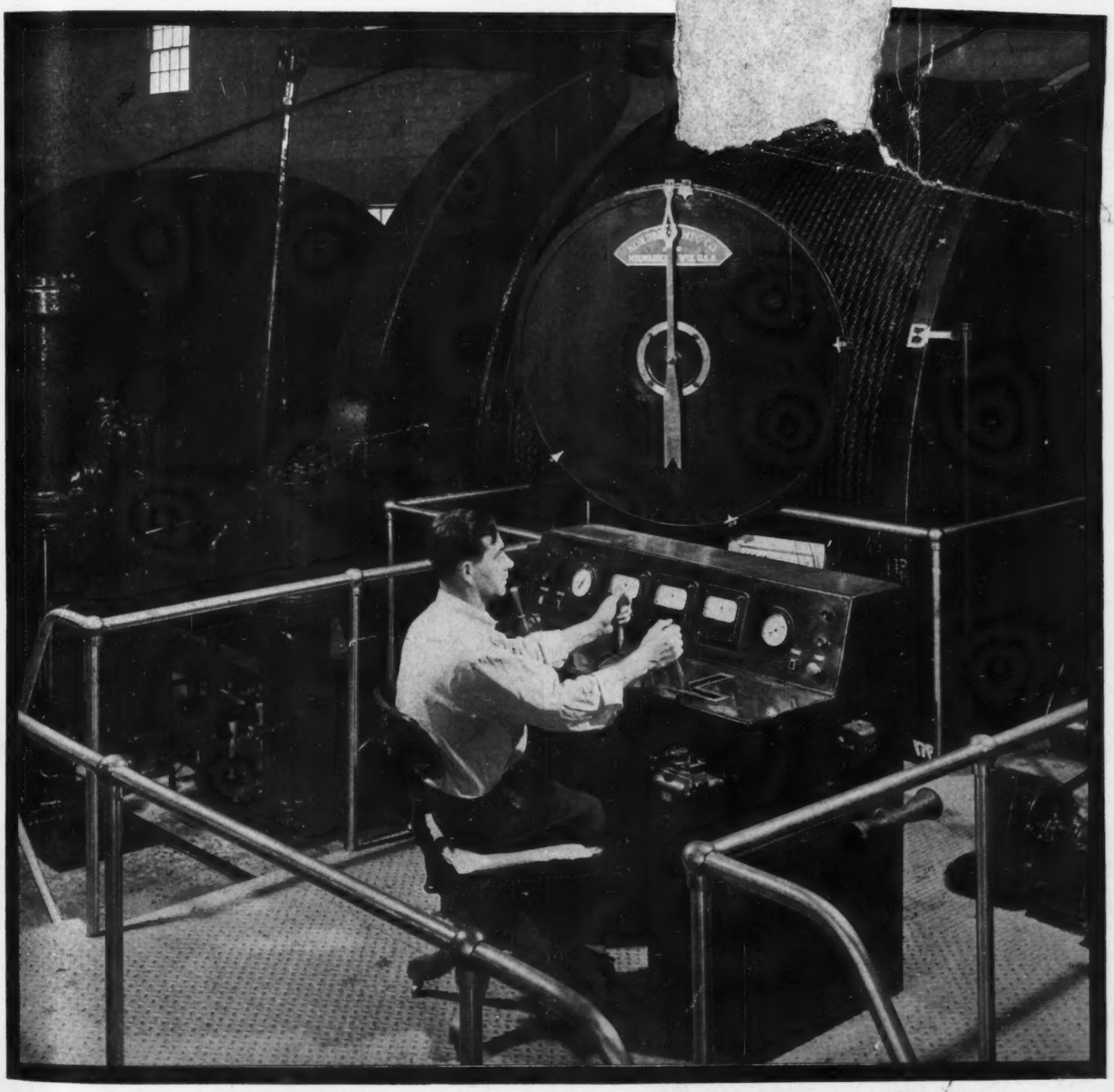
ENGINEERI[illegible]ND MINING JO[illegible]AL

A McGRAW HILL PU[illegible]TION

JULY 1947



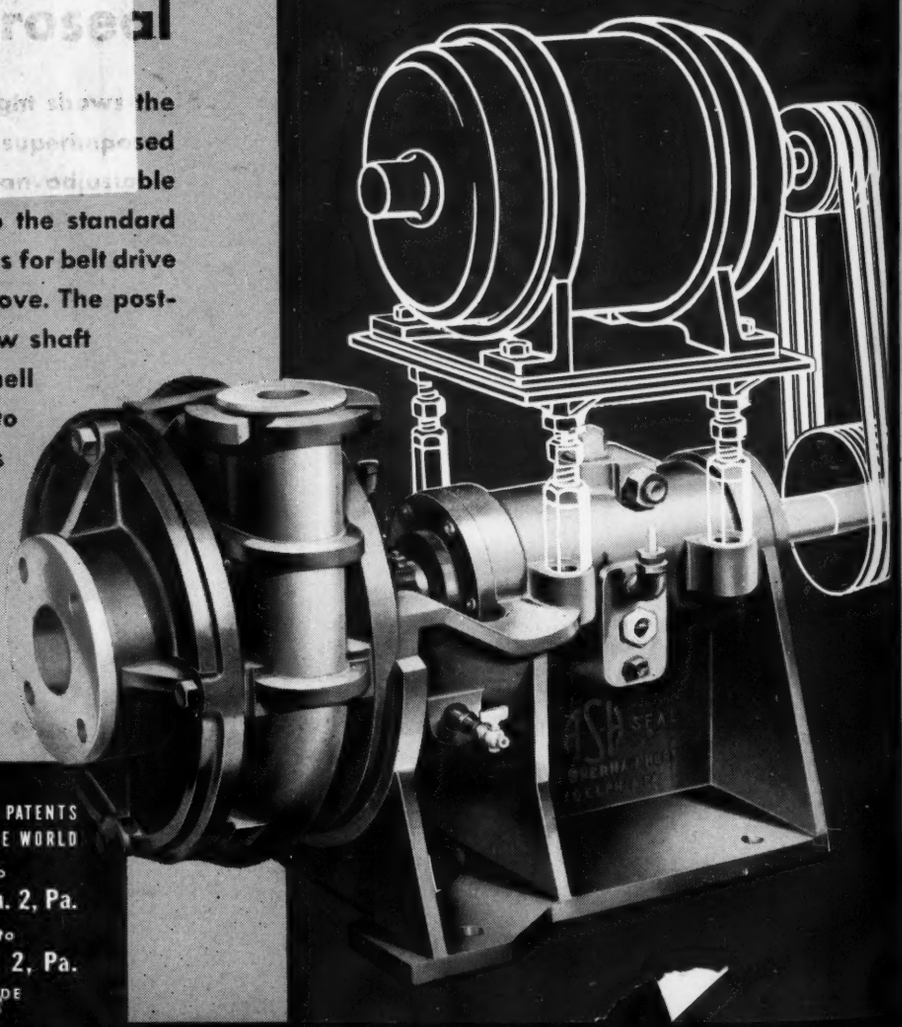
Modern equipment provides safe, effortless, hoist control at Mt. Hope mine, New Jersey

Communism Menaces the Mining Industry—Page 74

Hydroseal Pumps can be installed for a suction lift as well as a positive suction, thus greatly simplifying some installations. Two or more Hydroseal Pumps in series have the discharge of the first stage pump directly connected to the suction of the second stage pump, etc. Staging greatly increases heads and often saves booster pumping stations with their attendance, power lines, etc.

2 in 1 Drive Design of Standard Hydroseal

Photographic reproduction in lower right shows the Standard Hydroseal Pump, while the superimposed drawing in white lines shows new and adjustable base for overhead motor is added to the standard construction. The one design thus serves for belt drive with the motor either alongside or above. The post-war Hydroseal has new bearings, new shaft and bearing adjustment and a new shell mounting which allows the discharge to be placed horizontally left or right, as well as vertical. Send for Catalog No. 547 which describes the modern Hydroseal, with its time proved advantages of power and maintenance economies in abrasives materials pumping.



HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

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ENGINEERING AND MINING JOURNAL

JULY, 1947

Outstanding Liberal Urges Industrial Harmony

ADDRESSING the meeting of the Idaho Mining Association at Sun Valley in late May on "Post-War Handling of Labor," W. J. O'Connor, manager of the Utah department of American Smelting and Refining Co., offered views that merit attention.

Mr. O'Connor, a practical liberal who has spent "thirty years on the firing line," believes in the fundamental decency and common sense of American working men. His view is that the confidence of workers in management was impaired because the workers blamed management for the excesses of the "roaring twenties" and for the ensuing depression. This loss of confidence gave an alliance of opportunistic politicians and headstrong labor leaders—the New Deal—an opening to exploit the entire population, with results we all know only too well. However, despite New Deal propaganda, the workman knows that it was the productive power of a free-enterprise system that won the war. By his vote he has voiced his desire to perpetuate that system.

Mr. O'Connor believes that, considering the changed cost of living and taxes, wages are not too high if labor does a fair day's work. His opinion is that personal inefficiency, featherbedding, and absenteeism will take care of themselves when times become less opulent, and that the worst feature fastened on industry by wartime unionism is promotion by seniority alone.

The current swing of public opinion against the New Deal philosophy and the legislative checks and balances newly incorporated into the Wagner Act give intelligent management a chance to regain the confidence of workmen. As measures toward that end, Mr. O'Connor suggests that management must maintain an open-minded, non-vindictive approach toward labor problems, seeking the workman's good will and building up his individual pride in his own job. He urges educating the employee to the significance of his own activity, and on the importance and problems of the enterprise. He recommends efforts to eliminate unpleasant work by mechanization. In place of simply telling men to do a job, he urges encouragement of their interest and pride by inviting suggestions toward doing it better or easier.

By such an approach, Mr. O'Connor believes, industrial harmony can be restored, the confidence of older workmen can be regained, and the minds of younger workers can be purged of the hatreds and "something for nothing" ideas which have been instilled into their minds.

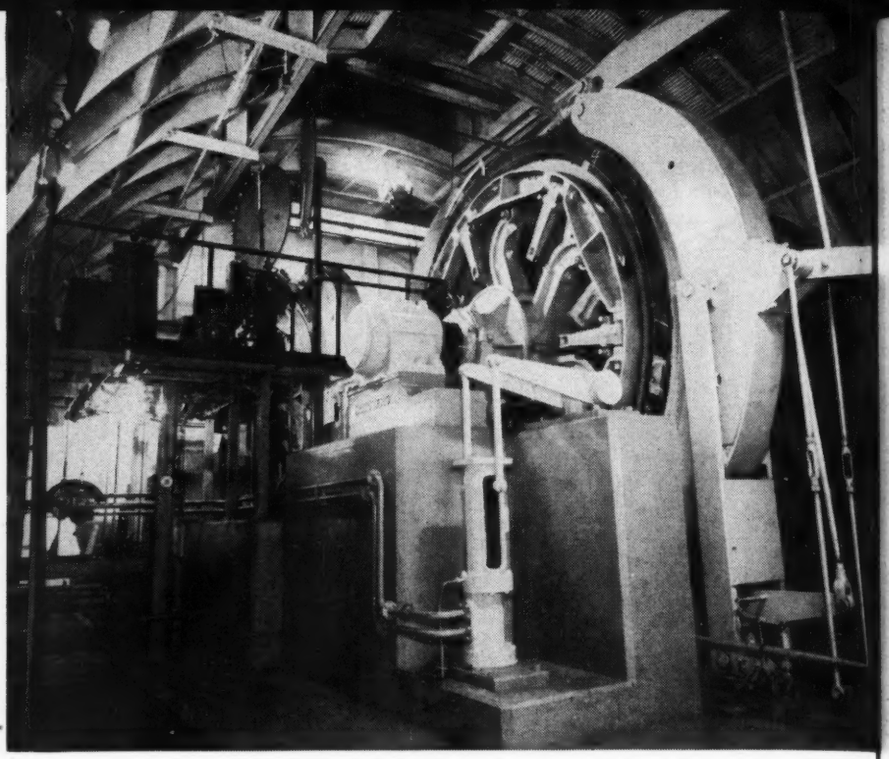
Watch the Non-Metallics

THE GREATER and greater utilization of non-metallic minerals should inspire people engaged in metal mining to pay closer heed to commercial opportunities in the non-metallic field.

The non-metallics in general involve market penetration or development of new markets as prerequisites to success in the exploitation of deposits. In some instances, commercial success has been attained chiefly by reason of the highly desirable properties of the mineral products that have been found and brought to the attention of prospective users. Many mineral deposits favorably situated with respect to markets and railroad rates, or new in respect to commercial possibilities, await the enterprising mining man who has sufficient technical knowledge to explore the postwar industrial field. Capital is needed, and it is obvious also that some new producers in highly competitive markets will find the going rough at times.

Certain industries, notably sand, gravel, and broken stone, limestone and lime, cement and clay, all supplying the construction field, have attracted metal-mining men, who have in many instances successfully penetrated these industries. They have succeeded chiefly by reason of experience in management, in tonnage production, and in the application of machinery. Their weakest point has been lack of knowledge of sales methods and business in general. As in the non-ferrous branch of the industry, some enterprises are fortunate in possessing ample supplies of raw materials, whereas others are dependent on finding new deposits of essential material after they have become established in business. In addition, there is a continuous search for and discovery of new economic minerals, and their conversion into new products.

Bunker Hill's newest underground hoist room was literally built from the roof down. Unusual features in excavation and construction of the hoist room, rope raise, and generator room are described by members of the Bunker Hill staff.



OVERWIND DRUM of new hoist installed in Bunker Hill's modern underground hoist room. The drums are set in tandem and slightly offset to make the installation compact. Operator's platform is shown at upper left, and rope raise to incline shaft appears in upper center.

Installing Bunker Hill's Large Underground Hoist

A. C. STEVENSON, Chief Engineer, Mechanical and Electrical Departments; **STANLEY W. McDOUGALL,** Mine Superintendent; **V. M. VANG,** Assistant Chief Engineer, Mechanical and Electrical Departments, Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho.

AS OREBODIES were discovered and developed at the Bunker Hill & Sullivan Mining & Concentration Co.'s property, Kellogg, Idaho, the growth of the mine was paralleled by the installation of newer and larger hoists. An account of developments leading to the present modern hoist follows.

The vein system of the Bunker Hill & Sullivan mine in general is rather flat and dips southerly. At depth, the orebodies lie under a high ridge, the country rock above the lowest levels measuring more than 5,000 ft. Until driving of the Kellogg tunnel, started in 1893 and completed in 1902, the orebodies were developed by a series of adits driven at different elevations. The Kellogg tunnel is about 100 ft. above the floor of the Coeur d'Alene Valley at an elevation of 2,400 ft. It enters the ore zone at a point 9,000 ft. from the portal.

In 1905, and at a point 9,000 ft. from the portal of the Kellogg tunnel, the three-compartment, incline No. 1 shaft was started. It was sunk on a 50-deg. angle. Levels were established at 200-ft. intervals. The Kellogg tunnel was the No. 9 level. All ore mined from the deep levels has been hoisted through this shaft.

Larger Hoist Needed

The original hoist was a double-drum compressed-air unit. This was replaced in 1912 by a double-drum Allis-Chalmers electric hoist. This unit in turn was replaced in 1924 by a Coeur d'Alene Hardware Foundry hoist, powered by a 600-hp. motor.

In 1937 new orebodies were discovered on the 19 and 21 levels. The shaft was later sunk to the 23 level. A large tonnage of ore was developed in this area, and owing to depletion of ore on the upper levels more hoisting capacity was needed to maintain normal mine production from the new horizon.

Sinking of a new vertical shaft was considered, but because this would mean an underground shaft and hoist installation the company decided to improve the present shaft and install a new hoist with greater hoisting speed and larger capacity. Work to rebuild the shaft started in 1938.

All cross sills and cross ties were removed from under the skip tracks and longitudinal 20-ft. stringers were placed under the rails to support them. These stringers were fish-plated and bolted end to end. Sleepers, sufficiently long to reach across both hoisting compartments, were placed under the stringers of both tracks at intervals and posted to hold them firmly against the bottom of the shaft. The stringers then were bolted through and firmly held to these sleepers. See accom-

panying drawing of rebuilt shaft.

This construction supported the rails firmly and permitted cable rollers to be lowered below the rail base. It also allowed the skip bottom to be lowered to the top of the rail. Guides were installed on the bottom of the skip to prevent derailment. The size of the cross-section of the skip body was also increased.

The new hoist had to be large enough to handle ore from present working depths as well as ore from future lower levels. As the incline shaft is about one-third longer than the actual vertical depth, the hoist must wind one-third more rope. Existing ground conditions called for a compact installation to keep down the cost of excavations and maintenance.

The hoist selected had to have a capacity of 2,000 tons in 16 hr. from the 29 level, a vertical depth of 4,000 ft., or 5,000 ft. on the incline, leaving one 8-hr. shift for maintenance. The hoist was required to wind 6,000 ft. of rope in not more than three layers, with the drums set in tandem for greater compactness.

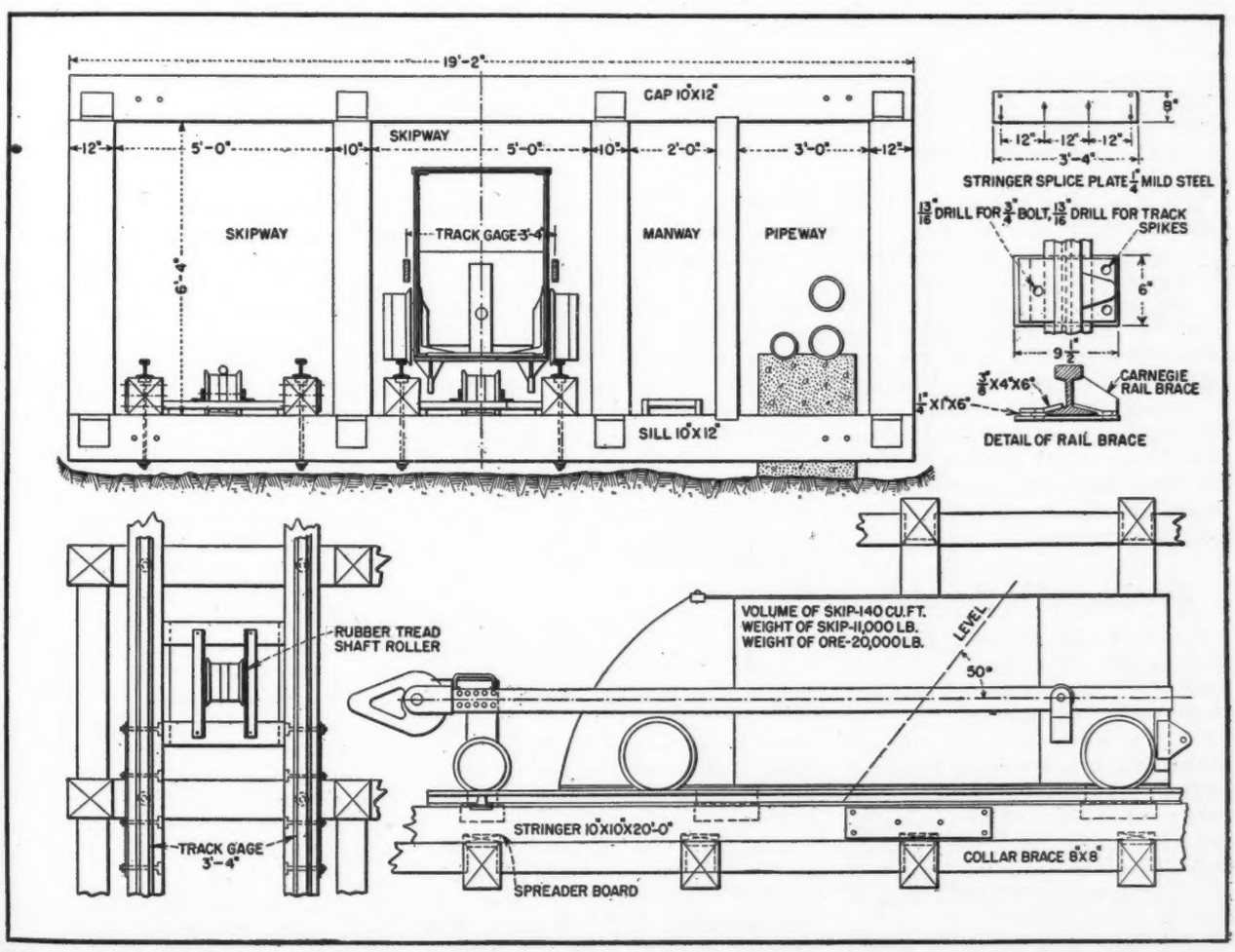
The work was authorized in August 1943. A 1,200-hp. Nordberg hoist with tandem drums was ordered. Cross-cutting was started to the site of the new hoist room. The excavation was estimated to total some 435,000 cu.ft., consisting of: drifts and crosscuts, 149,850 cu.ft.; generator room, 22,100 cu. ft.; hoist room, 174,000 cu.ft.; rope raise and sheave room, 63,000 cu. ft.; shaft extension and dump room, 10,600 cu.ft.; and new ore and waste pockets, 15,500 cu.ft.

How Work Was Planned

All early excavation was planned so that temporary timbering would be placed inside the finished concrete and steel. Thus temporary timber could be used for bracing concrete forms and supporting steel arches until they were welded in place.

Narrower openings such as the generator room, rope raise, and all drifts were cut full width with temporary timber for roof support. After concrete walls and footings were in place, the back was taken down at one end of the hoist room to provide space for three steel beams, or 10 ft. of steel structure, to be put in place. Once the beams were in place and covered and packed between the sheets and the rock, room was made for the next 10-ft. section of steel. A drifter drill was used to breast down the back in the shape of an arch, with 6 to 10 in. of space between the steel and rock for packing.

Because of the large size of the hoist room, and the necessity of supporting the roof if more than a small section was open at one time, a system similar to that used in excavating extra-wide tunnels was used. See illustration. Drifts were driven along all four walls at floor level, and one drift was driven in the center of the arch at the top of the room. Then the rock was trimmed and concrete walls and footing for the steel arches were constructed. Next the rock was stoped from the lower drifts to the upper drift to provide space for a



NO. 1 INCLINE SHAFT was rebuilt and timbered as shown above. Skip capacity was increased, and guides were installed beneath the skip to prevent derailment. New hoist is large enough to handle material from a depth of 5,000 ft. on the incline.

MOTOR-GENERATOR SET and primary control board in generator room. Steel arches are separated by pipe spreaders, and covered with corrugated sheet metal.

10-ft. section of the steel. This left a central core of rock on which to support the back temporarily with timber, and the steel beams until welded in position. After the first 10-ft. section of steel had been placed, the sheeting was started at the bottom of both sides of the arch. The space between the rock and the sheets was then filled with a mixture of sand, gravel, and clay which was prepared in a concrete mixer and pumped into place quite wet.

The rope raise end of the hoist room was finished last. Because of the different shape and necessity for a steel superstructure on top of the arches, the excavation was outlined by incline raises with temporary timber. The rock core was blasted and removed after all concrete walls and steel were in place. To keep the shaft in operation for all but very short periods of time, the shaft was sunk from the new sheave room to a connection at the old sheave room.

Ore Pocket Is Circular

New pockets consisted of two vertical raises connected to circular sections of the ore pocket and the waste pocket measuring 14 ft. and 10 ft. in inside diameter respectively. Work was started from the loading station, and square sets were used to timber them. A raise, one set in size, was put through first. Then the raise was enlarged for more square sets to the desired size.

All broken rock from the rooms was loaded by mechanical shovels. Where 90-deg. corners were required, the machine was worked on a cross track to obviate breaking of rock to provide space for curved tracks. Broken rock some distance away from the track was moved to the track by a scraper and then handled by the loader.

Equipment for pumping concrete in place consisted of a 10-cu.ft. concrete mixer with extended loading skip track. The extended track provided sufficient elevation so the mixer discharge would empty into the hopper of a No. 160 Rex Pumpcrete machine. This unit has a rated capacity of either 9 or 18 cu.yd. per hr., regulated by a two-speed motor running either 900 or 1,800 r.p.m. Included with this equipment is some 600 ft. of 6-in. o.d., ⅛-in. wall pipe equipped with special male and female joints, with two iron wedges for tightening joints against special rubber gaskets, leaving a smooth interior surface in the entire length of the pipe. The pipe and connections withstand a working pressure of 250 lb. per square inch.

The pump pushes concrete through 800 ft. of horizontal pipe or 100 ft. of vertical lift, or a combination of both, allowing 8 ft. of horizontal for 1 ft. of elevation. Friction-head loss for all pipe bends must also be allowed for in determining the maximum pump distances.

Concrete was pumped on low speed. Twenty to 25 10-cu.ft. batches were mixed per hour, or the equivalent of 7 to 8 cu.yd. The amount of form work was usually planned so that the pours would average from 35 to 45 cu.yd. This required 5 to 6 hr. pumping time and could be poured in a regular shift. Remaining time was used in cleaning out the pipe line and machines. The pipe line was cleaned out by placing two double-headed rubber piston-type go-devils into a 3-ft. length of pipe inserted in the line at the pump discharge. A wad of excelsior was packed between the go-devils. The pump was then converted into a water pump, the hopper filled with water, and the go-devils pumped through the entire line. This pushed the concrete out ahead of the go-devils, and cleaned the line. Occasionally, it was necessary to make larger pours, requiring overtime. The largest single pour was 70 cu.yd.

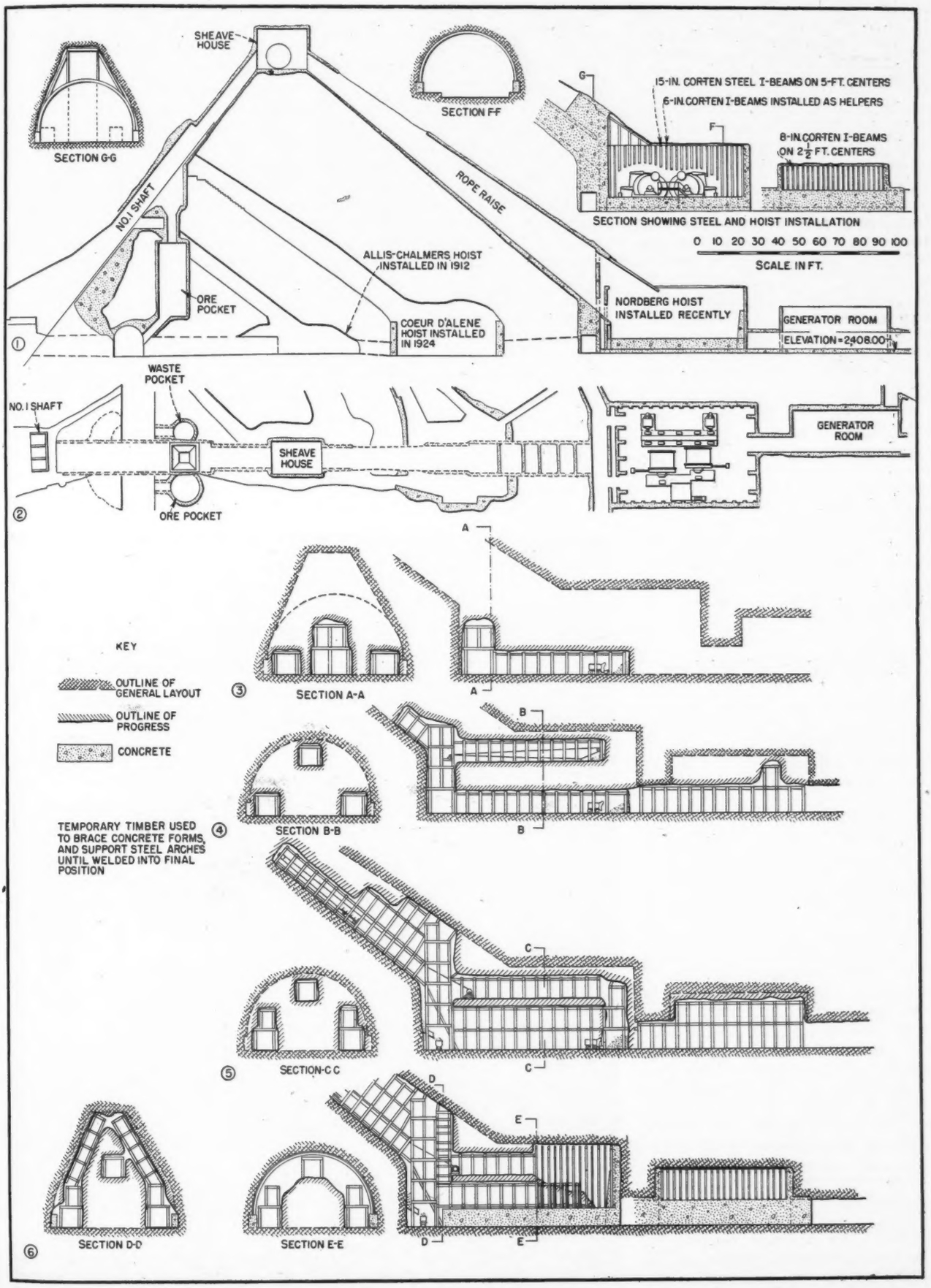
Minimum space required for the equipment set-up was about 10x25 ft. and a 15-ft. height over the mixer loading skip area. Additional space had to be provided for storage of sand, gravel, and cement to make a 40-cu.yd. pour.

"Lubricated" Cement Used

The amount of cement used was from 5½ to 6 sacks per cubic yard. Diatomaceous earth was added to the mix, serving both as a lubricant for pushing concrete through the long distributing pipe discharge line and increasing the workability of concrete in the forms. Air vibrators were used to puddle concrete in the forms.

Construction for the new hoist installation consisted of four distinct phases: (1) mining; (2) forming and placing reinforcing steel for concrete pours; (3) constructing steel housing structures; and (4) installation of machinery and equipment. Mining and concrete work were carried on as continuous operations by having several different areas under construction at the same time. As soon as miners had prepared a section to be concreted, form work was started, followed by early pouring of concrete. After each pouring, the miners opened up additional ground while carpenters and the concrete crew started work on another area vacated by the miners.

The first concrete pouring set-up was situated at No. 2 station, a distance of 500 ft. from the hoist room and 650 ft. from the far end of the generator room. All concrete for the footings and side walls of the hoist room, connecting tunnel between the hoist room and generator room, and the generator room was



ELEVATION AND PLAN of hoist and shaft installation are shown in Figs. 1 and 2, respectively. Figs. 3 to 6, inclusive show progressive stages in excavation and construction. Installation and construction of steel arches was advanced few feet at a time.

poured from this location. Upon completion of the generator room steel superstructure, pumping equipment was moved to the generator room. Good storage space was available here. From this site the hoist foundation, hoist room floor, high rope raise end wall, and the 80-ft. concrete portion of the rope raise were poured.

A second Pumpcrete machine was installed to relay concrete pumping to the higher elevation of the rope raise and sheave room, a vertical distance of 152 ft. above the hoist-room floor level. In addition, the concrete lining in the collar-side raise was carried down far enough so that concrete connection could be made from the collar side through the ore pocket with one set-up.

The Pumpcrete unit in the rope raise was then moved to one of the first early-day hoist installation rooms. Another 10-cu.ft. extended track mixer was purchased for this location. This set-up was used in pouring the waste pocket and ore pocket and connecting chute necks to the skip-dump receiving hopper. A total of 6,500 cu.yd. of concrete was poured in the construction of the complete hoist installation.

Steel Design a Problem

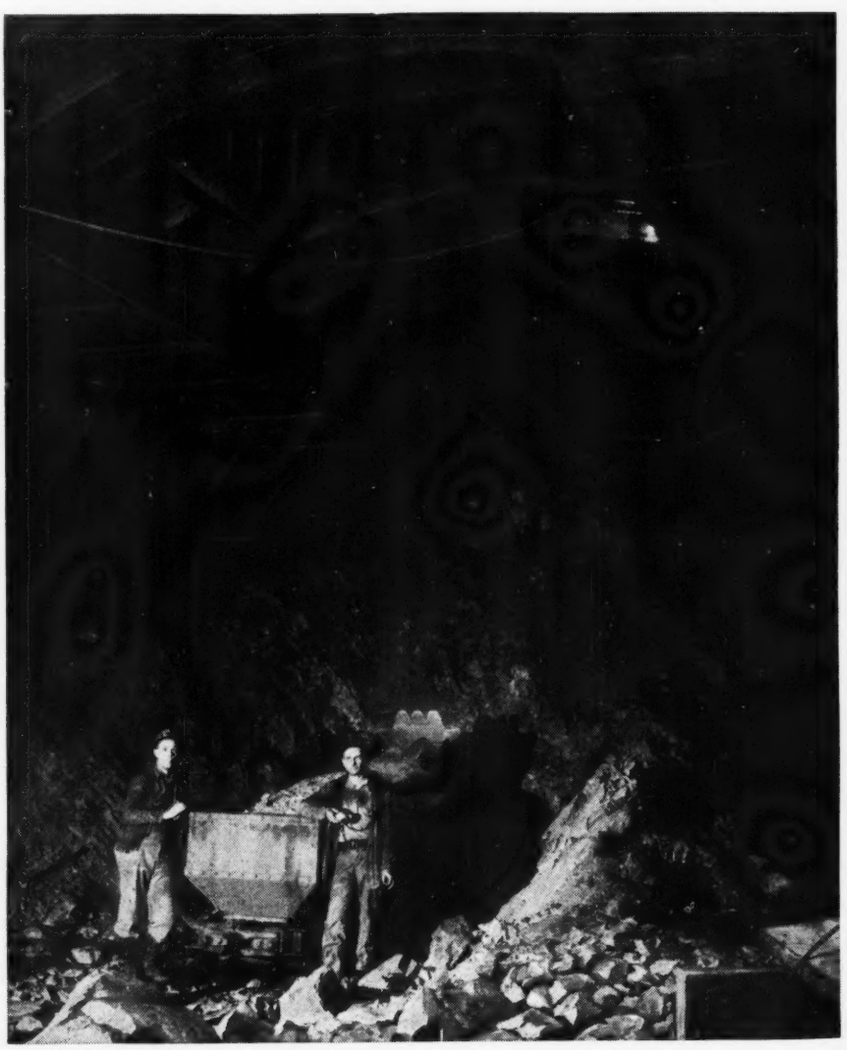
Because the new installation was close to previous excavations, and required removal of large volumes of rock, design of the steel and concrete structures posed a problem. The steel structures were designed to carry a load that would result if the ground broke up to a sharp-pointed arch above the structure. No effort was made in the design to resist primary ground movement. The hoist room is constructed with 15-in. Cor-ten steel I-beams, rolled at the mill in circular segments with radius to the center line of web 23 ft. Three of these segments constitute a complete arch. They were welded together electrically. The 15-in. circular beams were placed on 5-ft. centers. Midway between these a helper arch was placed to reduce the span in supporting the covering. The helper arch also was rolled circular and in segments, but made from 6-in. Cor-ten I-beams. Lateral bracing of the main beams carries the helper arch. There are 14 main arches. The covering consists of Cor-ten corrugated sheets $\frac{1}{8}$ in. thick, lapped, one corrugation toward the watershed. The sheets are 10 ft. long, and butt together at the center and on top of the main arches. The covering also is electrically welded in place.

The generator room is of similar construction, but smaller in size and with a different arch design. The generator equipment was placed in a separate room to prevent the hoist operator from being distracted by the noise resulting from electric machines operating at high speed. Eight-inch Cor-ten I-beams on $2\frac{1}{2}$-ft. centers were used for the arch. The beams were made in two circular segments, 11-ft. radius. Lateral braces of standard 3-in. pipe were welded between the webs of the beams.

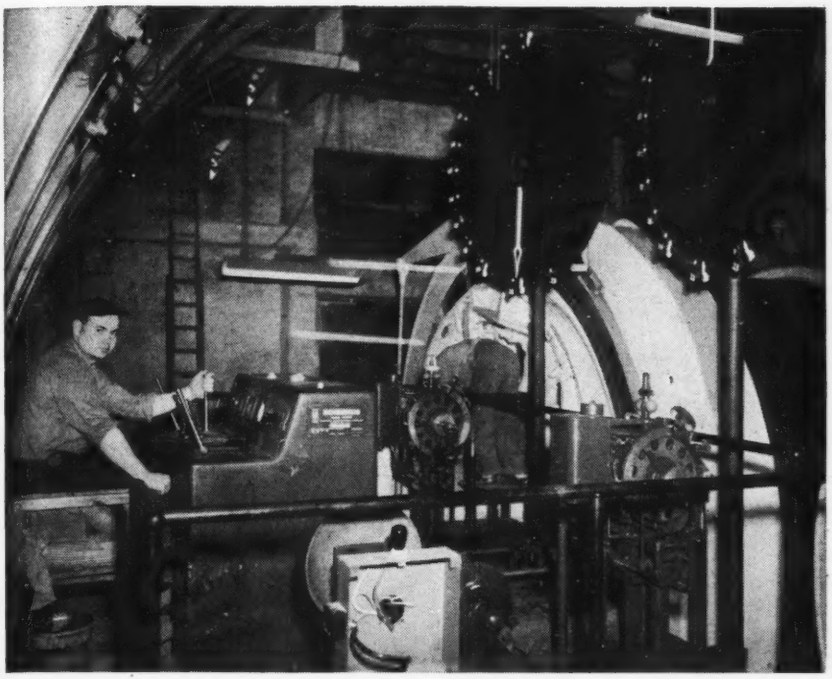
The base portion of each room is of concrete, forming a footing for the steel structure and adding to the over-all height of the rooms. End walls are of concrete.

Specifications of the hoist are as follows: Drum diameter, 12 ft.; face, 8 ft.; grooved to wind 6,000 ft. of $1\frac{5}{8}$-in. cable; each drum clutched. The drums are mounted in tandem, and slightly offset so that the post brake, brake ring, and large-diameter portions of the equipment of one drum overlap those of the other. This allows a closer center-line to center-line setting. The motors are 600 hp., 600 r.p.m., 250 v., separately excited. Clutches and brakes are operated by hydraulic engines. A compressed-air pressure system circulates the hydraulic oil. Operation of the brake and clutch engines is through pilot valves under the hoist deck. As no appreciable force is required to operate the pilot valves, all hoist control levers are small. These are mounted on a console on the hoist deck, which also holds all electrical control levers, indicating instruments, and gages. All operating pilot valves are of the balanced type so that the movement of the engines is in direct proportion to the movement of the control lever.

The electrical equipment was cal-



AFTER INSTALLATION of steel arches, braces, and sheet-metal roofing, the central rock mass of the hoist room was excavated. See line drawing on previous page.



NEW HOIST IS EQUIPPED with mechanical slow-down cams, overspeed devices, limit switches, brake-wear switches, back-out switches, and Amplidyne control system.

culated from constructed duty cycles and load diagrams, which give the following calculated and actual data. The hoist duty is as follows: Shaft, double compartment; balanced hoisting; grade, 50 deg. to the horizontal; maximum lift, 6,000 ft.; minimum operating level, 500 ft.; weight of each skip, 8,000 lb.; weight of ore per trip, 20,000 lb.; diameter of hoist cable, 1⅜ in.; weight of cable, one side, 25,380 lb.; hoist drums, double cylindrical, clutched; drum diameter, 12 ft.; the WR^2 of hoist moving parts and head sheaves, 5,000,000 lb.-ft.^{2}; rated maximum speed of drums, 40 r.p.m.; rated maximum rope speed, 1,500 f.p.m.; normal acceleration time, 15 sec.; normal retardation time, 15 sec.; and minimum loading time, 10 sec.

The motor-generator set is a three-unit machine consisting of a synchronous motor, 1,450 kva. at 0.8 power factor, 40 deg., 900 r.p.m., 13,200 v., 3 phase, 60 cycle. This motor, designed to carry 200% load momentarily, drives two 500-kw., 250-v., separately excited, d.c. generators, which also will carry 200% load momentarily. Armatures of all d.c. machines are connected in alternate series. With this connection all armatures must have the same current load, and, therefore, the same loading, with equal field strengths. Control is by means of Amplidyne, which eliminates all field-control contactors and all external large field resistances. The arrangement amplifies in direct ratio small signal currents which are impressed upon the control fields. These signal currents require only a small controller. Thus many points of control can be obtained easily.

The new hoist contains 38 points of control in each direction of rotation. Also, by the addition of fields to the Amplidyne generator it is possible to control current or voltage output of the generator closely, and obtain desired generator output. The 13,200-v. stator winding on the motor-generator synchronous motor fits in with the Bunker Hill underground power distribution system (*E.&M.J.*, Vol. 146, No. 4, April 1945). Power is transmitted underground through two 13,200-v. feeders. If a 2,400-v. motor had been used, it would have necessitated purchase of an additional transformer bank, plus the continuous loss therein during operation. All six leads are brought out on the synchronous motor, with primary winding and a reactor connected across three of them. The reactor is used in starting the motor, and operates to give a reduced starting voltage.

Hoist operation is under the control of two Type C Lilly controllers. Mechanical slow-down cams are provided at the end of the wind, profiled to give smooth deceleration. Acceleration and deceleration are automatic. The electric control lever may actually be thrown from the full forward position to the full reverse position, and the hoist will automatically slow down, stop, and come up to speed in the opposite direction. The slow-down for the dumping skips is also automatic, and controlled by cams. Overspeed devices are installed on both the hoist motors and the motor-generator set. Brake-wear switches insure proper holding and seating of the brakes.

All hoist bearings are lubricated by a continuous flow of oil under pressure, and any failure in the flow and pressure of the oil will stop the equipment. Electric interlocks are provided throughout the entire control, so that sequence must be correct before the hoist will move. Back-out switches will not permit further movement of a cage or skip in the wrong direction when either has gone beyond the limit of travel. The only motion possible under this condition is in the opposite direction to take the cage or skip out of the limit rather than in the wrong direction. Manspeed setting is provided. It is set at about 1,050 f.p.m.

Cast-Steel Sheaves Used

Idler sheaves are placed midway between the drum and head sheave under each rope. They are of light rim section, cast steel, and run on roller bearings which fleet along the supporting shafts as the rope position changes. The head sheaves also are of alloy cast steel. Both are supported on anti-friction bearings. Every effort consistent with good design was made to cut down the WR^2 in these moving parts.

Sectionalization of the hoist, sheaves, room structural steel, and other units was necessary to get them through the Kellogg tunnel to the erection sites. To give manufacturers the desired data and dimensions, many sketches were taken of tunnel cross-sections. When dimensional drawings of the various parts were submitted by the manufacturers, a silhouette or composite was made of wood representing dimension of large parts. This composite was mounted on a mine truck and taken through the tunnel. Where pipe lines, trolley wire, cable, low corners, and other objects interfered, the interfering object was moved so that the composite would pass. Actual parts were later transported without trouble.

COMMUNIST MEMBERSHIP is denied by everyone but Party leaders, yet crowds turn out for Communist rallies like this one at New York's Madison Square Garden in 1940. Earl Browder is speaking.

Communism Menaces

R. H. RAMSEY, Associate Editor

This article is based on study of books, newspapers, and magazines, and on conversations with persons who have lived in Russia, with members of the labor movement, and with men who have been, and some who may still be, members of the Communist Party in America. In this short space, little detailed analysis can be given of various statements made, but a list of supporting references has been prepared, which the editors will send you on request.

COMMUNIST ACTIVITY in the United States has reached a pitch that can no longer be ignored. Sheltered by our insistence on the right of each individual to freedom of speech and to freedom of religious and political beliefs, the Communists have for years chipped earnestly at the foundations of the system that makes their existence in America possible. Because this Marxist burrowing could become a real threat to the effectiveness of our democracy, especially in an emergency, it is time that American citizens should recognize the true nature of the Communist Party, and arm themselves against its propaganda and its schemes.

Unfortunately, metal mining seems to be one of the basic industries of the United States most deeply affected by Communist infiltration. For several years, evidence has piled up to support the belief that Communists and their sympathizers have gained control of key positions in the labor union dealt with by most metal-mining companies, and that this control has been used to serve Communist purposes instead of the workers' own interests. For the sake of peace and production in mining, that misuse of union leadership must stop.

First, let's see what Communists

SPLIT IN UNION, with communism as issue, has resulted in resignation of Reid Robinson (right) as president of Mine, Mill and Smelter Workers' Union. His successor (left) is Maurice Travis.

the Mining Industry

are like. Your average Communist is a cold fish with a grudge in his heart, an elastic conscience, and a strange willingness to let somebody from Russia lead him around by the nose. Russia comes first with him. You and America come second.

Nobody doubts that this fellow can fight. He can fight on a picket line, and he fought on the battle line. But he will drop a strike like a hot nickel, or he will become the loudest of conscientious objectors, if his bosses at the head of the party tell him to.

Back in 1939, Nazis in brown shirts were using German Communists for punching bags. The *Daily Worker*, newspaper of the American Communist Party, called the Fascists everything in the book. On Aug. 20, 1939, the *Daily Worker* asked, "Is it possible there can still be people who trust Hitler's word?"

They got their answer from Stalin himself, for three days later Uncle Joe and Adolf Hitler signed the famous pact that touched off the second World War. Yet Comrade Earl Browder, then chairman of the American Communist Party, declared without a blush on Aug. 24, 1939, that the Hitler-Stalin pact "is a great contribution to world peace."

Then, while Poland was raped and Hitler tore Holland, Belgium, and France to pieces, our American Communists called for strikes in war plants and no aid to the "imperialists." They picketed the White House; they yelled, "The Yanks Are *Not* Coming!"

Then Hitler attacked Stalin, too. Again, the Reds changed overnight. All of a sudden, the war became "a people's war" and anybody who went on strike was a heel and a traitor. They said the United States ought to be in it, and when we did get into the war, the Communists were in the front rank. That's fine, but where would the Reds have been if we had not been fighting for Russia as well as for ourselves?

A good answer to that is to look at the record of the French Commu-

Photographs by Press Association, Inc., and Wide World Photos, Inc.

THESE PEOPLE make up the Communist National Board. They are: (left to right), Irving Potash, CIO Furriers' Union; Robert Thompson, N. Y. State Party chairman; Louis Weinstock, AFL Painters' Union; John Williamson, labor secretary; Elizabeth Gurley Flynn, women's chairman; Eugene Dennis, general secretary; Steve Nelson, national group director; Ben Davis, Jr., N. Y. City councilman; Henry Winston, organizing secretary; Jack Stachel, chairman, agitation, press, education. William Z. Foster, Party leader, was absent. Elizabeth Gurley Flynn is known in most Western mining camps for bitter attacks on capitalism.

nists when only France and Britain were fighting Germany, and Russia was out of it. In 1940, according to the *Daily Worker*, the French Reds, under Maurice Thorez, were fighting a "valiant battle to end the imperialist war and establish a rule of the people of France." This Communist doubletalk really means that while Hitler attacked the French army from the front, the French Communists, on orders from Stalin, attacked from the rear. With considerable success, they worked to demoralize the French army and sabotage their own country's war effort.

This is history, not opinion. In a possible future war, the positions of the American Communists, deep in so many American labor unions, would give them an opportunity to do damage such as no saboteur in history ever had. We can't afford a risk like that. It is simply beyond doubt that Communists have only one loyalty, the Party, and they acknowledge only one authority, Moscow.

Actually, there are two kinds of Communists in the American branch of the Party. One kind, the leaders and those high up in the Party, know that they and the Party are nothing but tools of the foreign policy of the U.S.S.R. They do what Russia wants them to do; everything else is smokescreen.

The rest of the Communists, which includes many of the Party rank-and-filers, and the fellow travelers who string along without joining, have not caught on as yet to the way they're being used. Many American Communists sincerely believe that by destroying capitalism and democracy in America they will do the greatest good for the greatest number of Americans. They have been drugged by their own propaganda.

We have to admit that Communist propaganda is well done in spots. Pick out almost any phrase that means freedom, democracy, justice, equality. You'll find Communists have used it to whitewash themselves. They love to tell you how they follow in the footsteps of such American heroes as Tom Paine, Thomas Jefferson, Andrew Jackson, Abraham Lincoln. This is so outrageous as to be almost funny. Those men stood and fought for individual freedom and dignity in thought, word, and deed. They stood for everything that the Communist termites have pledged themselves to destroy.

What Makes Communists

It is hard to believe that Americans could swallow this Communist poison and willingly become Stalinist zombies. Yet, some do, beyond any doubt. Why do they do it?

Probably the reason why most Communists joined the Party is because they have a grudge against capitalism. Some boss got too rough on them, or they were out of work a long time, or maybe they were just too contrary to hold a good job. Also, a man may have become bitter over a family misfortune, or his parents, disappointed themselves, may have brought him up in an atmosphere of hatred and defeat, Whatever the cause, the man's nature is twisted, and he lacks the force of character to straighten it out. Boiling inside, he is probably thinking, "So they won't make a place for me in the system. Then I'll damn well change the system."

Along comes a Communist organizer looking for just such men. "Amen, comrade," he says. "Join up with us and we'll change the system together. We'll show those Wall Street bandits they can't push the common man around forever."

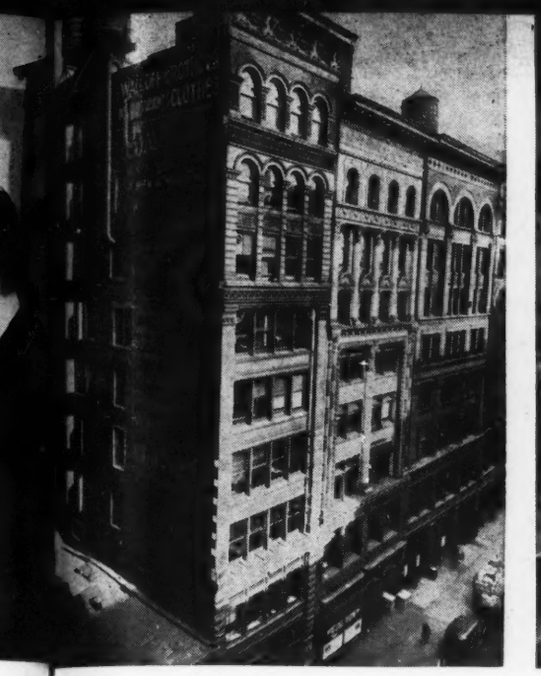
This dodge works on intellectuals as well as it does on a man who can't read or write. Anybody with a grievance, anybody who longs for security but fears he can't make the grade, anybody whose heart is full of hatred and envy, or who hopes to achieve power without working his way up. Such people are raw material for communism.

There are, of course, many other reasons why people join the Party, but whatever the reason, the result is the same. All Communists, except the callous opportunists, are alike in these three respects:

1. They believe that the capitalist system must be destroyed, and most of them believe it must be done violently.

2. They believe in Russia as the seat of all social justice and the only source of real social progress in the world today.

3. In support of those two beliefs, Communists will gladly work



FROM THE NINTH FLOOR of this building at 35 East 12th St., New York City, the National Board runs American communism.

FOLLOWING THE BOARD'S INSTRUCTIONS, Communists picket the State Department, Washington, D. C., Dec. 3, 1946, demanding withdrawal of U. S. aid to China's National Government. By such methods, native Communists help implement Soviet foreign policy.

to exhaustion, or suffer any indignity.

Let us make perfectly clear right here that communism is not a democratic political system or an economic philosophy. The Communist Party in the United States bears as little resemblance to say, the Democratic Party, as did Fritz Kuhn's Bund. If the Communists had the strength the Republicans now have, who believes there would ever be another free election in America?

Communism today is nothing but a name for the iron-fisted system by which the Russian people are governed. The Communist parties in other countries are merely the tools with which that system now defends itself and through which it hopes some day to rule the world.

Communism began in Russia as a large-scale experiment in readjusting society by killing off the people on top of the heap and setting up a dictatorship in the name of the working class. The State was to own the means of production, and the people were alleged to own the State. From Russia this proletarian revolution was to be spread all over the world.

Stalin was responsible for postponing the drive for world revolution. Being a hard-boiled product of jails and police beatings, he believes in force as the only final answer to all questions. Stalin decided that the Party must devote all its energy to tightening its grip on Russia and preparing to resist attack from outside. He now believes that more firmly than ever. He has therefore turned the Soviet experiment into a standard totalitarian police state in which 1,500,000 Communists rule 170,000,000 Russians by thought-control and brute force. To the outside world, Stalin will play the old game of power politics, using the world-wide net of Communist cells as catspaws, until the time is ripe for world revolution. He will do that unless a stronger force prevents him from doing it.

Labor in Russia

To get an idea of what Communism means to labor, let's take a look at how labor is treated in Russia, the left-winger's Promised Land. At first glance we see that Russian trade unions have become nothing but rubber stamps for the higher-ups. Working conditions are decided by the All-Union Central Council of Trade Unions,[1] a group about as far removed from the average worker as any clique of aristocrats ever was. Wages? "The fixing of wage scales must be left entirely in the hands of the heads of industry," said Andreiev, Party leader, in *Pravda*, in 1935.[2]

Workers in Russia can't get jobs without "labor books," a record of their behavior on each job they have held.[3] No book, no job. As nasty a way to blacklist unwanted men as has ever been devised! Strikes of course are forbidden in Russia.

Soviet industry is always trying to go Bedaux, the father of the "speed-up," one better in cooking up new ideas to get more out of the workers. Men who can stand the speed-up are called Stakhanovites, and they get medals.[4] The name comes from Alexei Stakhanov, who set a record in a mine of the Donetz Basin in 1933 by cutting 102 tons of coal against the normal 7 tons for the shift. Molotov called the speed-up "a cultured attitude toward work." (Speech in Moscow, 1936).

Thus, the Russian worker has no say in his working conditions, no say on wages, he can't strike, he can be blacklisted, he works under a speed-up system enforced by his government. And that's not all.

Under Stalin, the old idea of equal reward for everybody's work has been tossed into the ash can. Wage and salary differentials in the Soviet Union are now enormous. Nobody but the State makes a profit in Russia, but plenty of Russians are paid big salaries. In 1943 the Russian press joyfully hailed the first "proletarian millionaire," a man named Berdyebekov, director of a collective farm in Kazakstan.[5]

Higher education in Russia has been on a cash basis since 1940,[6] and only the rich bureaucrats and managers can afford to send their children to the industrial colleges. Scholarships are available for laborers' children, but they are

[1] Arthur Koestler, **The Yogi and the Commissar.** P. 162. Macmillan, New York, 1946.

[2] Peter Meyer. "The Soviet Union, A New Class Society." **Politics**, New York, March, 1944.

[3] Arthur Koestler, op. cit., p. 161.

[4] **Labour in the Land of Socialism.** Moscow, 1936.

[5] Arthur Koestler, op. cit., p. 157.

[6] Decree of Oct. 2, 1940, reported in **Isvestia**, Oct. 3, 1940.

BEFORE Hitler attacked Russia, American Communists were all for peace, as this 1940 rally shows. F. D. R. was a "war-monger."

harder to get than similar scholarships in the United States. Also, wealth can now be inherited in Russia.[7] The result of all this is that a caste system is being built up whereby the sons of workers remain workers, and the sons of the new aristocracy of bureaucrats, managers, and engineers are groomed for the better jobs.

Elections in Russia are a mockery from our point of view. There is one candidate for each office, the Party candidate. You are required to vote, but you can only vote either for or against this one man. At the polls, you take a look at the NKVD strong-arm boys who watch which box your ballot goes into, and you decide to drop your ballot in the "right" box. The Party men always seem to win!

The Soviets do not believe in a free press. Nobody reads anything in Russia that the Party does not want him to read. In New York I can go to a newsstand and buy papers of all shades of opinion, right from the Communist *Daily Worker* over to Hearst's *Journal-American.* Our democracy is virile enough to let its citizens form their own opinion. The Soviet dictatorship obviously is not.

It is dangerous to think for yourself in Russia. Right now there are substantial grounds for believing that somewhere around 17,000,000 persons are slaving and dying in forced labor camps in Siberia and elsewhere.[8] The only crime of most of them was real, or suspected, disagreement with the government.

This is the sort of "socialism" by which the Communist Party rules Russia. Think of all these things the next time you hear about how much communism does for the workers.

[7] New Soviet Constitution, 1936, Article 10.
[8] Arthur Koestler, op. cit., p. 175.

Reds in Labor Unions

So much for the blessings of communism on its home grounds. What does it do in our own unions? Because Communists owe their chief loyalty to Russia, because they hate capitalism and free enterprise, because they hate employers, and because they'll do anything to get what they want, it is almost impossible to build up a satisfactory collective bargaining relationship between management and a Communist-dominated local.

Lenin taught that the trade union (outside Russia, of course) is a school where workers learn revolution.

American labor leaders believe that the trade union is an instrument to improve wages, working conditions, and industrial well-being. That big difference between Communist and non-Communist labor leaders is the reason why the Commies are likely to fail in the long run. The workers don't come first with them, and sooner or later the workers will find that out.

Listen to the opinion of three top men in the CIO who formed a committee this spring at Philip Murray's request to investigate the Mine, Mill and Smelter Workers Union. These men reported, "The committee is firmly convinced that Maurice Travis and other International officers of the International Union of Mine, Mill and Smelter Workers have allowed the influences of the Communist Party to interfere with the internal affairs of the International Union."

Members of the Mine, Mill and Smelter Workers Union hardly need to be told what communism has done there. The battle over the Communist issue has so upset the union that some people think it will be years before stable labor relations again become possible in metal mining.

For those not familiar with the situation, here is what happened: For a long time, some of the non-Communists in the Mine, Mill union have been increasingly annoyed by the tactics of the left-wingers, but a truce was patched up for the duration of the war. This truce was broken last year during the campaign for election of international officers. James J. Leary and Ralph Rasmussen opposed Reid Robinson and Maurice Travis for president and vice president.

Robinson and Travis won the election, according to the official count, but a report of the minority of the election committee charged that there was evidence of enough irregularity in balloting to have swung the election to Leary and Rasmussen if the count had been correct.

Soon after that, one MMSW local after another began seceding from the International, the movement originating in the Connecticut "Brass Valley" and spreading through the Middle West. Eventually more than 40 locals, covering about 30,000 MMSW members, united as the Progressive Metalworkers Council, with a charter

AFTER Hitler attacked Russia, Communists grew blood-thirsty. Here, led by Browder, they demand second front in Europe.

from the CIO Industrial Union of Marine and Shipbuilding Workers. John J. Driscoll headed the new PMC union. Meanwhile, Reid Robinson resigned as MMSW president and his job was taken by Maurice Travis.

Philip Murray then appointed a CIO committee to try to find a way out of the tangle. The committee, Jacob Potofsky, Van A. Bittner, and L. S. Buckmaster, all right-wing officials of CIO unions, made these recommendations:

1. John Driscoll to be removed as secretary of the Connecticut State CIO.

2. Maurice Travis to be removed as MMSW president, and the union's affairs to be administered by the CIO until suitable officers could be elected.

3. The charters given to the rebel PMC by the Shipbuilders Union to be withdrawn.

Speaking for the MMSW high command, Reid Robinson denounced the report and said the union wouldn't comply. Speaking for the Shipbuilders, the General Executive Board of that union on May 24 refused to withdraw the charter of the PMC.

The CIO executive board had already crossed Philip Murray's wishes by not voting unanimously to accept the report. That means that the puzzle will have to be solved by the CIO convention next November, where a battle royal will probably result. After the meeting of the board, Philip Murray is reported to have got off some blistering comments on Communists and to have said it was high time that CIO officials quit apologizing for communism and get rid of its advocates.

Getting Rid of Reds

Nobody has to tell loyal American leaders of the labor movement who the Communists are or how to get rid of them. There are, however, a few problems in that difficult job, and they ought to be made clear.

First of all, it doesn't do much good to point your finger at a Red and cry, "He's a Communist!" unless you can prove it. Thanks to the numerous errors of the Dies Committee, and similarly ill-advised accusations, the bare statement would probably be dismissed as just more red-baiting. Therefore, in showing that Communist membership or sympathies make a man unworthy of holding office in a union, the case should be well documented.

Second, anybody who moves actively against communism must be prepared to endure the most violent slander and abuse. Terms like: dirty Fascist, union wrecker, drunkard, lunatic, mad dog, anti-labor, anti-Negro, anti-Semitic, anti-Catholic, red-baiting reactionary, and much worse, will be heaped on the opponent of communism.

Third, unity is vital to the labor movement, Communist or otherwise, and many labor leaders will hesitate to risk loss of that unity even to get rid of Communists. Philip Murray has moved slowly against the Reds in the CIO, not because he is friendly to them but because he hates to put too great a strain on the CIO's solidarity.

If labor leaders were sure of the support of the rank and file, there would be no problem. Workers tend to be lackadaisical about taking a real interest in their unions. They must be educated to attend meetings, vote at elections, and see that elections are run honestly. They must learn to recognize real democracy in union affairs, not the phony Communist "democracy." Lacking such interest by the rank and file, some locals have simply dropped like plums into Communists' laps.

Last, if labor leaders were sure of the support of management, they'd feel better about attacking Communists. Many non-Communist labor leaders have a cold feeling that some managements would like nothing better than a red hot battle to the death within the union they deal with. Therefore, if a management is sincere in wanting to get rid of Communist control in a union, it had better find some way of convincing the non-Communists of its good will toward them.

No sane management wants to fight with its employees all the time. You can't battle your workers continually in bargaining sessions and then expect them to go back to the mine or the smelter and give their all for you. That's why the Communists want to keep the battle going. They want managers to appear to workers as cold-blooded agents of Wall Street whose job it is to beat down the workers' rights. Why has labor productivity fallen off so greatly in some places? The Reds know at least part of the answer.

Mining management has to find a way around the Commies and get

COMMUNISTS MARCH in May Day parade, New York City, May 1, 1947. Note banner boosting socialism for "World of Tomorrow." For nature of "socialism," see text.

the true picture over to the rank and file of the union. This is a difficult job, and each case will take individual study and intelligent handling. Essentially the job is one of making it clear to workers that management is not out to capitalize on dissension in union affairs. Don't forget that American workers have a good fund of common sense and considerable ability to think for themselves. Certainly, if the workers swallowed without question all the hate propaganda constantly fed them by the Communists, the employers of this country would have been strung up long ago.

To begin with, it would do no good to work to drive out Communist leadership if the company's labor policy is going to antagonize its employees anyway. Therefore, a company must do its best to build good industrial relations before it plans any move against the Reds.

Next, management must make sure of who is a Communist and who isn't. Nothing embitters a non-Communist union man more than to have his employer brand him as a Red. After all, a man who asks for a 30% wage increase may be just an optimist instead of a Communist. Labor leaders can drive a hard bargain with you and still believe in free enterprise. Look at John L. Lewis. He's no Communist, but life with him is no joy-ride either.

Therefore, identification is of prime importance. Fortunately the job is made easier by the ridiculous fidelity with which the American Communists follow the Moscow line. Time and again in recent years, Stalin has without warning turned up another street, leaving our native Reds flopping about in the temporary confusion that goes with forming their ranks in the new direction. Yesterday's slogans are forgotten. Today's slogans, perhaps directly opposed to yesterday's, are quickly memorized, and off the comrades go again, lock-stepping toward their fake Utopia.

Find out, then, how your man stood on various past issues, but remember that a man can have favored the same thing the Commies did once or twice and still be a good American. However, beware of the fellow who goes the whole way with the Communists, screaming when they scream, jumping when they jump, back-flipping whenever they do.

The chief value to management of spotting the Communists among the leaders of the local union is that management is then forewarned on the tactics these leaders may use. Day-to-day dealing with such men is exceedingly difficult, and the employer must be especially alert and far-sighted. A seemingly innocent demand may turn out to be another brick in the wall the Reds are patiently building between employer and employee. Management can help break up this game, but the main job of dislodging Communists is one for the union rank and file, not the employer.

Management might better devote its efforts to clearing up the atmosphere in which Communists thrive. This can be done by building self-respect in each worker and encouraging that pride in work that is noticeable lately chiefly by its absence. In order to restore pride in a good job well done, management must overcome the handicaps of several years of something-for-nothing New Dealism. Probably the job can best be done by working through the supervisors, who come into closest contact with each man. The aim should be to rebuild the confidence, good will, and job pride of each individual.

Belief in Democracy

After all, the strength of our Democracy lies in a state of mind, the summation of the attitudes of 140,000,000 Americans. The special quality of the democratic state of mind is freedom, the dignity and pride in oneself as an individual. Most of us know that feeling; and we seem to take it for granted that all of us do. Yet the very existence of the Communist Party in America proves that not all Americans have pride in themselves.

Last May Day I watched the Communists in New York on parade. Ranks closed up, eyes front, men and women tramped along, shouting woodenly the slogans passed to them by squad leaders marching beside them. In these people, individual pride was dead.

This marching, chanting monster is a threat to liberty and decency the world over, to the man down in the mine as well as to the man in the front office. If *they* should have their way, you would live in fear of your life and the safety of your family. Your mind, and worst of all, your children's minds, would be warped and molded by rigidly controlled propaganda. If you should ever have thoughts divergent from those desired by the chiefs of state, you would not dare voice these thoughts to your best friends or even to your own family. That is how every Russian from Molotov on down lives today, in the shadow of betrayal to the concentration camp, or the machine gun.

If we want to keep clear of all that, we have got to work and work hard. We have got to keep on proving that democratic freedom, as we know it, is a worthwhile possession. Let the worker ever remember that, with all its faults, a free America has given all its citizens greater individual liberty and more material wealth than any other society in all human experience. Let management men shoulder a responsibility to those who work with them and for them. Let them build men up as individuals. Help them find pride in their jobs and their communities. These are obligations to our free America that all of us share and must accept. There is no other way to keep America free.

A Record That Speaks for Itself

FROM THE *DAILY WORKER:*

These are quotations from editorials and reports of speeches by Communist leaders as they appeared in the *Daily Worker*, newspaper of the American Communist Party, published in New York City.

FROM THE *UNION* (MMSW):

These are quotations from editorials, letters from the international office of the union, and speeches of officers of the Mine, Mill and Smelter Workers Union (CIO), as they appeared in the *Union*, official newspaper of the MMSW.

BEFORE THE HITLER-STALIN PACT

"J. P. Morgan & Co., the duPont clan, the General Motors Corporation, the Standard Oil Co., the Ford family, and the Anaconda copper kings have supplied the substance which has enabled the Fascist powers to transform their dream of conquest into horrible reality." July 9, 1939.

"These American dictators (referring to Wall Street 'interests') have the same type of mania for conquest as their Fascist brethren." May 1, 1939.

HITLER-STALIN PACT SIGNED AUG. 23, 1939. WAR BEGINS SEPT. 3, 1939

"This war . . . is not a war against Fascism, not a war to protect small nations from aggression, not a war with any of the character of a just war, not a war that workers can, or ever should, support. The workers must be against this war. . . . Keep America out of the imperialist war!" Sept. 19, 1939.

"America is not in danger. It will not be in danger, no matter what the outcome of the present war in Europe. . . . We must work to keep America out of war." Oct. 23, 1939.

THE BURKE-WADSWORTH BILL, FOR COMPULSORY MILITARY SERVICE, IS PROPOSED

"Passage of the Burke-Wadsworth Bill will obviously increase the danger that the United States will be plunged into the horror of imperialist war. The job of those who want to preserve American democratic institutions is to mobilize public sentiment against this Fascist Bill." July 28, 1940.

"Stern opposition to the sweeping Burke-Wadsworth Bill, which would turn America into a goose-stepping nation in uniform on the European model even in peacetime, was voiced by the International Union this week." Aug. 5, 1940.

"Conscription is entirely unnecessary, undemocratic, and unAmerican." Letter to locals, Aug. 5, 1940.

THE WAR ENTERS ITS SECOND YEAR

"It is not the people's fight. It is not the people's war. America need not be the arsenal of war." Sept. 1, 1940.

"We hate war because the workers do the fighting, the bleeding, and the dying, while others reap the harvest of blood-soaked profits." Speech, Chicago, Sept. 2, 1940.

THE LEND-LEASE BILL (H. R. 1776) IS PROPOSED

"Move your trade union to let its voice be heard. Vote down H.R. 1776!" Feb. 26, 1941.

"This is the most dangerous piece of legislation (Lend-Lease, H.R. 1776) affecting the workers of America that has ever been presented to the Congress of the United States." Letter to locals, Feb. 26, 1941.

ROOSEVELT CALLS FOR ALL-OUT AID TO BRITAIN

"Stop the deceitful aid-to-Britain policy, which is leading to dictatorship and war. IT'S A RICH MAN'S WAR." Jan. 30, 1941.

"This is not a war to wipe out the evils of Hitlerism and tyranny. All-out aid for the British empire, or any other such warring empire, means total war for the American people." March 17, 1941.

BEFORE THEY HEARD THAT HITLER HAD ATTACKED RUSSIA

"The imperialist stakes for which the White House and the Wilhelmstrasse are playing offer no benefit to the people. The people want none of this war." June 22, 1941.

"Brother M. . . . denounced the conflict abroad as another imperialist war." Report of earlier speech, June 23, 1941.

HITLER ATTACKS RUSSIA, JUNE 22, 1941

"The involvement of the Soviet Union has therefore basically altered the dominant character of the war. All-out aid to the Soviet and the British peoples is the only way by which to successfully defend the national and social interests of the American people today." July 13, 1941.

"This is a people's war, and only if the main mass organizations of the working class, the trade unions, are keenly active can the war be expected to accomplish its great task, the destruction of Hitler and Hitlerism." Sept. 21, 1941.

"In view of this new turn of events, there can be no doubt that our Government is correct in its decision to give all possible aid to the peoples of Britain and the Soviet Union and all who fight Fascism on the battlefields of the world." July 21, 1941.

"It seems clear therefore that continued military victories for Hitler mean our inevitable involvement in the war." Speech, Joplin, Mo., Aug. 4, 1941.

"This is a people's war, and as such must get our undying support." Dec. 15, 1941.

RUSSIA CALLS FOR A SECOND FRONT IN EUROPE

"The Second Front (in Europe) is the single most important political issue before the American people. It is not a question that can just be left to the 'military experts,' many of whom have been consistently wrong ever since the war began. This is the issue when the whole American people—and labor above all—must be heard." May 16, 1942.

"MMSW local unions continued last week in greater numbers to adopt resolutions demanding that the United States and Great Britain immediately open a Second Front against Hitler in Western Europe." May 25, 1942.

Safety and Low Costs

JAMES K. RICHARDSON, Manager, Utah Mining Association

Safety work in metal mines deserves greater emphasis because: (1) As a cost-cutting item, accident prevention offers rich returns, and (2) High over-all frequency and severity rates lay the industry open to criticism.

NEVER BEFORE IN HISTORY has mine management needed to give operating costs closer scrutiny. The squeeze between rising production costs and the limited price which consumers will consent to pay leaves management no choice but to re-examine new and effective ways to cut costs.

The National Safety Council has found that some managements, seeking a means to trim expenses, are tempted to curtail funds earmarked for accident prevention, too often considered merely a charitable donation.

That would be a mistake, because safety can and should be an important black ink item. One able operator who knows a sound accident prevention program can return as much as $4 for each $1 spent is Clinton H. Crane, president of the St. Joseph Lead Co. He ought to know; the figures come from his own operations.

"The prevention of accidents is good business in the mining industry, in addition to its other values," he said recently. "The six-year average cost of compensation of the St. Joseph Lead Co., a self-insurer, for the years 1940 through 1945 was $1.13 per $100 of payroll, this covering the salaries and expenses of the safety department. The total cost, therefore, has been $1.76. The company would have had to pay $2.81 had it purchased compensation, and the average cost of such compensation for the mines of the State was $5.30.

The St. Joseph Lead Co.'s remarkable saving did not just happen. It grew from a realization that safety can be made to pay, that it must get active top-management support the same as production or any other phase of the business, and that it depends upon a thoroughly organized safety program.

Safety will not pay as long as it is treated as a costly stepchild whose only excuse for existence is a nebulous humanitarian ideal. Management must be in safety; safety men must be in management. Accident prevention must be as eagerly and intelligently sought as production and sales.

The payoff can be big—a saving of a million dollars in the case of another large company, and in a period of strict cost control a million dollars should merit the respect of the most skeptical business man. This company operates in an area where the manual compensation rate for mines, including occupational diseases, is about $10 per $100 of payroll. After including all costs of the safety and medical departments, compensation and other accident expenses, its safety costs were about $2 per $100 or a saving of 8% of payroll—or more than $1,000,000 annually.

Profits resulting from accident prevention are not limited to large operations. A mining company employing 125 persons spent $40,200 for injury accidents in one year. Such a heavy cost item stimulated the company into an effective accident prevention program which two years later had toppled the annual cost to $2,770. At the end of the

A successful safety program starts with "enlightened" management and follows through with "enlightened" workmen. Topic for the day (at left): Test the back and bar down. U. S. B. M. Photo.

sixth year it was $600. The six-year saving amounted to $227,000, based on costs prevailing the year before the program was launched—an amount probably more important to the financial health of this small company than the $1,000,000 was to the larger operator.

In any careful analysis of accident costs, it will be obvious to wise managements that the direct costs of accidents, such as compensation and liability claims, insurance overhead, medical and hospital expense, and time paid for but not worked, are only the most apparent part of the picture. Indirect costs, hidden in the usual cost structure, are authoritatively estimated at about four times the direct cost—a fact which every employer must consider in the economical conduct of his business. These hidden costs include damage to property, interrupted operation, delays due to training or hiring replacement workers, and lower efficiency of employees. If such items as public relations and employee relations could be evaluated, the hidden costs of accidents might well exceed even the four to one ratio.

Much of the uncertainty in present business operations stems from the unpredictable relations with organized labor, and wage differences are only part of the problem. So-called fringe issues in labor disputes are becoming the tail that wags the dog. Some observers believe labor leaders realize that inflated prices will wipe out further wage increases, and they expect future negotiations will attempt to improve labor's lot by pressing for fringe benefits.

Are Inseparable

Even hazardous jobs like this can be made safe. U. S. B. M. Photo.

Labor Demands Safety

Metal mine operators should not overlook the safety demands of John L. Lewis in last year's bituminous coal strike. Following that strike, Edwin A. Lahey, one of the nation's keenest labor reporters, wrote, "The non-wage issues in both the coal and railroad strikes were stressed more than the straight wage demands. The miners wanted a welfare fund and a revolution in safety procedures, while the railroad workers were intent on changing a number of their work rules. In the months and years immediately ahead . . . non-wage issues are expected to loom large . . ."

Naming safety and health as one of the important fringe issues, he said, "The issue of safety requirements is now hot because industry operated during the war without being able to maintain plants and machines as they normally do in peacetime. As a result of the miners' agitation, safety will probably become more and more an issue of collective bargaining."

The position of the underground metal mine operators is little better than the coal operators in justifying the high accident severity rates of their industry to employees and the public. Only coal mines have a higher severity rate, as illustrated by the accompanying table based on National Safety Council statistics. The metal mine severity rate of 6.3 is about five times the average rate for all industries. The fact that frequency is only about twice the all-industries average is slight consolation to the miner or to the public, who always thinks in terms of death and maiming. See accompanying table, page 68.

Metal mining so far has escaped general censure, especially on the part of the public, for its high accident severity rate. In the public mind, the spectacular catastrophes of the coal mines have associated danger primarily with the coal industry. However, on the theory that the barn door should be locked be-

fore the horse is stolen, now is the time for the metal mine operators to act before difficult labor situations arise and the industry is smeared in the eyes of the public. Reforms made in the heat of controversy often are ill-considered, and hurried state or national safety legislation may be one-sided and impracticable.

That the job can be done effectively by the operators themselves is proved by the outstanding record of the Lake Superior Mining Section of the National Safety Council. This record is not bettered by other mining groups anywhere in the country.

Safety departments of the companies cooperate closely with the Health and Safety Branch of the U. S. Bureau of Mines. Monthly safety meetings, attended by officials, supervisors, and the men, are held in various localities in Wisconsin, Michigan and Minnesota. The June meeting is a two-day safety conference at which the attendance is more than 500.

General interest in preventing accidents is backed up by concrete safety measures. Well-guarded machinery, good housekeeping, personal protective equipment, numerous safety devices and training in safe practices characterize operations above and below ground. As a result many outstanding safety records have been made in the area.

Unusual Safety Records

The East Vulcan mine, an underground property operated by the Penn Iron Mining Co. unit of Pickands, Mather & Co., worked 525,113 man-hours over a period of 10 years without a lost-time accident. The Cleveland-Cliffs Iron Co., at Ishpeming, Mich., has operated 23 months or over 11,500,000 manhours without a fatality and the record was still unbroken on Feb. 1, 1947.

Mines in other sections of the country have also demonstrated that accident prevention is not a geographical phenomenon. The New Cornelia Branch of the Phelps Dodge Co., at Ajo, Ariz.,—an open-pit mine—operated 1,517,500 manhours with a perfect record. An outstanding demonstration of accident-control under severe difficulties was made by the Parmenter mine, operated by the Eagle-Picher Mining Co. in the Tri-State district, which worked at top production throughout the war without the occurrence of a lost-time injury.

Average Frequency Rates by Type of Mine, 1944

Type of Mine	Frequency Rate* All Injuries	Fatal
Iron	24.1	.67
Non-metal	51.8	.60
Copper	53.7	.80
Lead-Zinc (Mississippi Valley)	70.5	1.12
Coal	65.8	1.29
Gold, silver, and misc.	94.0	.84

* Number of disabling injuries per 1,000,000 hours worked.
Source: U. S. Bureau of Mines.

Frequency and Severity Rates by Industries

Industry	Frequency Rate**	Severity Rate*
Communications	3.2	0.1
Steel	6.9	1.8
All industries	13.4	1.2
Underground metal mines	26.2	6.3
Coal mines	61.3	10.7

* Number of days charged per 1,000 man-hours.
** Disabling injuries per 1,000,000 hrs.
Source: National Safety Council compilations for comparable companies.

The accompanying table shows the relatively better frequency rate of the iron mines, largely centered in the Lake Superior district. The active safety work in such mines is due to the affiliation of many of them with the steel companies, which were among the founders and early leaders of the safety movement and still are among the most successful in accident prevention. This long-held conviction, that accidents can be stopped, pays off through the entire organization. See accompanying table.

As a guide for future progress in safety, let's look at a few forces which have improved the status of this work. First, there is enlightened management which has not only shown by high efficiency records that safety pays, but has used this evidence as a "prod" to encourage others to follow.

Second, Dan Harrington and his staff of the Bureau of Mines have helped much to develop safer methods and equipment. In a recent address before the Northwest Mining Association, L. H. McGuire of the Bureau cited a large mining company in the Coeur d'Alenes which cut frequency rates in half and severity rates to one-third, following a safety program which was adopted by the company. The program followed inspection and recommendations by Bureau of Mines representatives.

Manufacturers also played an important part in safety progress. High ammonia-content explosives which are less sensitive to flame, shock, and friction, have largely replaced the single explosive ingredient, nitroglycerine. Improved fume conditions have resulted from scientific wrapping of dynamite cartridges. Detonator composition has been changed to decrease their sensitivity during handling. Packaging of detonators has been improved. Electric detonators are now shunted at the factory to decrease the dangers of premature explosions.

In underground transportation elaborate dispatching systems, block signals, trouble-free frogs and switches, automatic couplings, and air brakes make the job safer.

Shaft jumbos, column-mounted drifters on air bars, impact wrenches to draw up hanging rods, air driven saws and clamshell buckets all contribute to safety in shaft sinking.

In drilling, steel centralizers keep the miner out of range of small flying rock chips while collaring holes. The New York backhead on drills makes it impossible to collar a hole dry. Improved drill steel decreases the danger of "shanking" steel. Drill jumbos reduce the hazards of setting up heavy drills, columns, and arms.

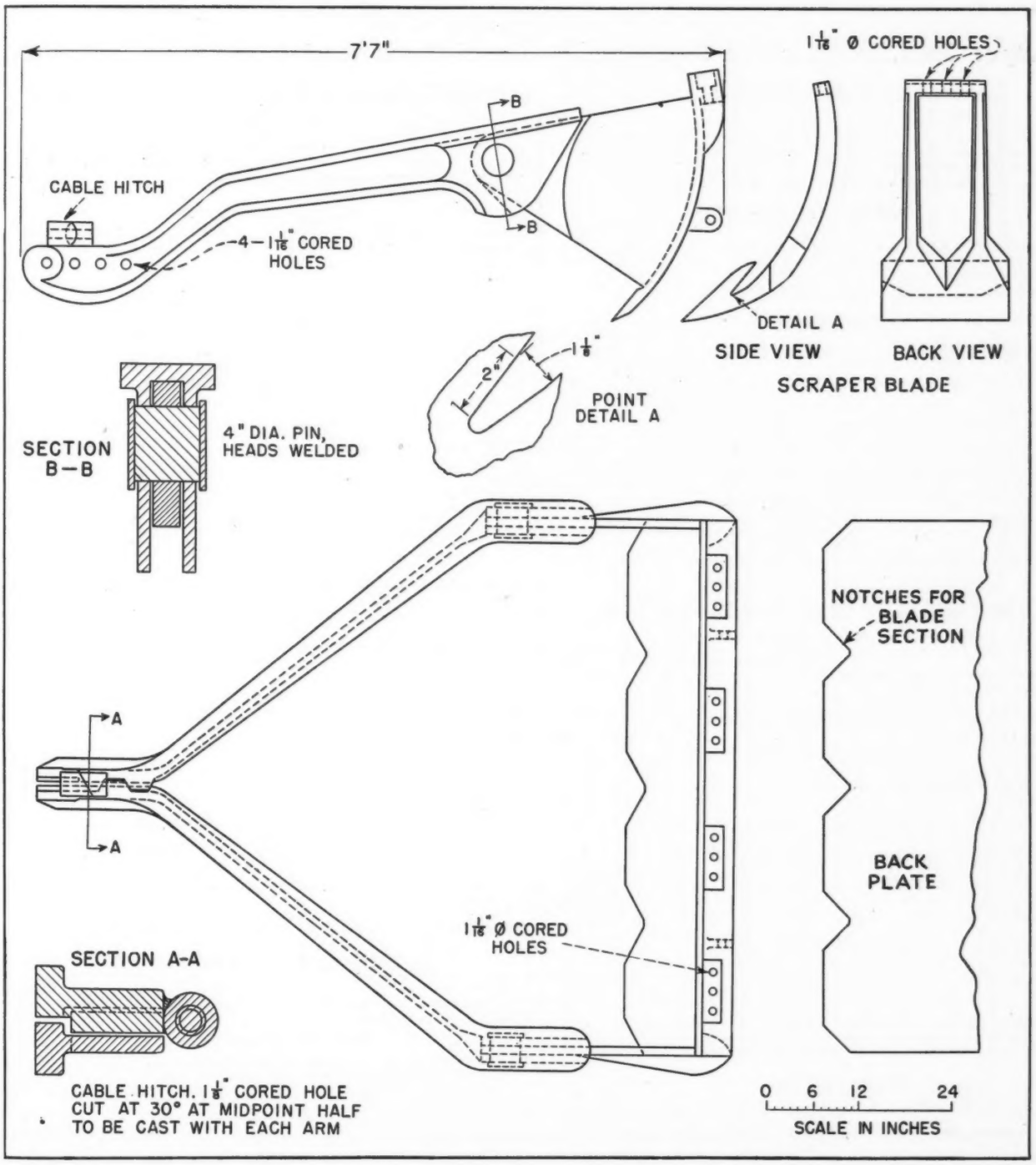
Mine safety equipment makers have improved miners' lamps, lightened hard hats, provided corrective lenses for safety goggles, developed new light self-generating oxygen breathing apparatus, and introduced noxious gas detectors.

Rock Falls Worst Hazard

Substantial progress could be made in metal mine safety if the efforts of operators were concentrated on one hazard alone—falls of rock—which result in 35% of the deaths and 17% of the injuries in the industry. Progress in reducing these serious accidents during the past 15 years has been small. Yet the problem is not incapable of solution, and many have demonstrated that adequate thought and effort will produce substantial reductions in such injuries.

That is only one of the hazards that mine management must lick. It is the starting point for a program of safety which, if carried out, will turn a heavy cost item into a profit item, and will remove one stumbling block to industrial peace.

Hinged Scraper Saves Wear



THIS HINGED SCRAPER was designed by H. J. Clemmer, mechanical and electrical superintendent, Chelan Division, Howe Sound Co., Holden, Wash., for use in slusher drifts. Construction details and general dimensions are given in the accompanying illustration. It will be noted that the scraper blades are made in sections and are interchangeable. Because of the over-all sturdy construction of the scraper, no trouble has been experienced in the hinge point. The chief advantage of the hinged or folding feature incorporated in the design of the scraper is a material reduction in the wear of blades and teeth, owing to the fact that the scraper on the back haul slides along on heavy wear ribs rather than on the edge of the blade or tooth, as with all solid-type scrapers.

After several months of operation, it has been found that the scraper gives good service in normal drifts and correctly working draw holes, and wear on the digging blades has been low. However, some difficulty has been encountered when using the scraper in flooded drifts with badly worn draw holes. Here, it was hard to get the scraper behind the muck pile and the blade refused to unfold. The scraper then slid down the muck pile without picking up the load. In normal drifts, however, the angle of the blade as shown in the above illustration appears to be right for efficient operation.

Production Costs Under

Output, Costs, Revenue and Operating Margins of Mines Receiving Premium Payments

TRI-STATE DISTRICT

	1941	1942	1943	1944	1945	
Number of reporting mines.	28	51	104	107	118	
Grade, Zn & Pb recoverable	2.76	2.51	2.02	1.89	1.79	
Production of Reporting Mines						
						1941-45
Thousands of tons, lead....	15.8	23.4	32.5	24.0	21.0	116.7
Thousands of tons, zinc.....	79.0	101.4	131.5	130.4	96.1	538.4
Percentage of U. S. total lead-zinc.....	7.8	10.0	13.7	13.6	11.7	
Distribution of Total Income						
						Present (est.)
Cents per pound (metal):						
Operating cost.....	3.46	4.75	6.65	7.25	8.12	8.8
Marketing cost.....	2.37	2.55	2.70	2.67	2.69	4.5
Royalty.....	0.47	0.56	0.72	0.76	0.80	0.8
Margin.....	0.94	1.18	2.26	2.12	1.39	1.8
Total.....	7.24	9.04	12.33	12.80	13.00	15.9
Dollars per ton (ore):						
Operating cost.....	1.91	2.38	2.70	2.75	2.93	2.93
Marketing cost.....	1.30	1.27	1.10	1.01	0.97	1.48
Royalty.....	0.26	0.28	0.29	0.29	0.29	0.26
Margin.....	0.52	0.59	0.92	0.81	0.50	0.60
Total.....	3.99	4.52	5.01	4.86	4.69	5.27

MEDIUM-SIZED LEAD AND ZINC MINES

(Except Tri-State)

	1941	1942	1943	1944	1945
Number of reporting mines.....	11	12	15	15	13
Production of Reporting Mines					
Thousands of tons, ore.....	1,577	2,294	2,117	1,924	1,517
Thousands of tons, lead.....	85.5	51.1	31.9	27.9	20.7
Thousands of tons, zinc.....	74.2	76.0	77.9	76.5	59.5
Percentage of U. S. total lead-zinc.....	13.2	10.0	9.2	9.2	8.0
Grade of Ore					
Percent, copper.....	0.17	0.05	0.08	0.05	0.06
Percent, lead.....	5.42	2.25	1.51	1.36	1.36
Percent, zinc.....	4.71	3.32	3.68	3.97	3.93
Ounces, gold.....	0.012	0.014	0.025	0.016	0.023
Ounces, silver.....	3.21	1.49	1.82	1.19	1.02
Distribution of Value, per ton					
Copper.....	$0.41	$0.12	$0.19	$0.12	$0.14
Lead.....	6.30	2.93	1.96	1.88	1.88
Zinc.....	6.95	5.49	6.05	6.55	6.48
Gold.....	0.42	0.48	0.87	0.56	0.80
Silver.....	2.45	1.04	1.27	0.84	0.72
Total.....	$16.53	$10.06	$10.34	$9.95	$10.02
Distribution of Total Income					
Cents per pound (metal):					
Marketing cost.....	3.95¢	4.33¢	4.42¢	4.65¢	4.63¢
Operating cost.....	2.96¢	3.81¢	5.50¢	5.20¢	4.96¢
Total cost.....	6.91¢	8.14¢	9.92¢	9.85¢	9.59¢
Less—copper, gold and silver credits.....	1.62¢	1.48¢	2.25¢	1.42¢	1.57¢
Net cost.....	5.29¢	6.66¢	7.67¢	8.43¢	8.02¢
Operating margin.....	1.20¢	1.35¢	1.94¢	2.11¢	1.89¢
Gross market value plus premiums.....	6.49¢	8.01¢	9.61¢	10.54¢	9.91¢
Less—premiums.....	0	0.45¢	1.91¢	2.64¢	2.04¢
Gross market value.....	6.49¢	7.56¢	7.70¢	7.90¢	7.87¢
Dollars per ton (ore):					
Gross market value.....	$16.53	$10.06	$10.34	$9.95	$10.02
Market cost.....	8.04	4.82	4.60	4.97	4.91
Market revenue.....	8.49	5.24	5.74	4.98	5.11
Premium revenue.....	0.00	0.50	1.98	2.82	2.16
Total revenue.....	8.49	5.74	7.72	7.80	7.27
Operating cost.....	6.06	4.24	5.71	5.55	5.27
Operating margin.....	2.43	1.50	2.01	2.25	2.00

LEAD AND ZINC MINES UNDER 5000 TONS PER YEAR

(Except Tri-State)

	1941	1942	1943	1944	1945
Number of reporting mines.....	39	45	61	66	95
Production of Reporting Mines					
Thousands of tons, ore.....	1,578	1,723	1,912	2,349	3,022
Thousands of tons, lead.....	36.0	38.6	39.9	47.0	54.2
Thousands of tons, zinc.....	28.6	48.3	60.2	67.6	82.8
Percentage of U. S. total lead-zinc.....	5.3	6.8	8.4	10.1	13.7
Grade of Ore					
Percent, copper.....	0.17	0.09	0.11	0.16	0.10
Percent, lead.....	2.30	2.24	2.09	2.01	1.80
Percent, Zinc.....	1.80	2.89	3.15	2.88	2.73
Ounces, gold.....	0.054	0.049	0.031	0.027	0.017
Ounces, silver.....	2.90	2.66	1.88	1.54	1.62
Distribution of Value, per Ton					
Copper.....	$0.41	$0.22	$0.26	$0.39	$0.24
Lead.....	2.66	2.91	2.72	2.61	2.34
Zinc.....	2.70	4.75	5.20	4.75	4.50
Gold.....	1.90	1.75	1.05	0.94	0.59
Silver.....	2.03	1.87	1.32	1.08	1.14
Total.....	$9.70	$11.50	$10.55	$9.77	$8.81
Distribution of Total Income					
Cents per pound (metal):					
Marketing cost.....	3.15¢	5.18¢	5.12¢	4.60¢	5.20¢
Operating cost.....	8.03¢	6.58¢	7.53¢	7.71¢	7.82¢
Total cost.....	11.18¢	11.76¢	12.65¢	12.31¢	13.02¢
Less—copper, gold and silver credits.....	5.29¢	4.74¢	2.52¢	2.46¢	2.16¢
Net cost.....	5.89¢	7.02¢	10.13¢	9.85¢	10.86¢
Operating margin.....	0.62¢	0.76¢	1.77¢	1.82¢	1.45¢
Gross market value plus premiums.....	6.51¢	7.78¢	11.90¢	11.67¢	12.31¢
Less—premiums.....	0	1.13¢	4.40¢	4.18¢	4.86¢
Gross market value.....	6.51¢	6.65¢	7.50¢	7.49¢	7.45¢
Dollars per ton (ore):					
Gross market value.....	$9.70	$11.50	$10.55	$9.77	$8.81
Marketing cost.....	2.59	5.28	5.40	4.52	4.71
Market revenue.....	7.11	6.22	5.15	5.25	4.10
Premium revenue.....	0.00	1.26	4.60	4.11	4.43
Total revenue.....	7.11	7.48	9.75	9.36	8.53
Operating cost.....	6.60	6.70	7.90	7.58	7.21
Operating margin.....	0.51	0.78	1.85	1.78	1.32

MEDIUM-SIZED COPPER MINES

	1941	1942	1943	1944	1945
Number of reporting mines.....	8	10	11	10	9
Production of Reporting Mines					
Thousands of tons, ore.....	14,859	21,000	21,062	20,949	19,149
Thousands of tons, copper.....	173.3	324.9	301.6	257.6	204.5
Percentage of U. S. total.....	18	30	28	25	26
Grade of Ore					
Percent, copper.....	1.16%	1.63%	1.43%	1.26%	1.07%
Ounces, silver.....	0.08	0.34	0.30	0.26	0.35
Ounces, gold.....	0.004	0.004	0.001	0.002	0.004
Distribution of Value, per Ton					
Copper.....	$2.78	$3.91	$3.44	$3.02	$2.57
Silver.....	0.06	0.24	0.21	0.19	0.25
Gold.....	0.14	0.14	0.04	0.07	0.14
Lead—zinc credit.....	0.04	0.03	0.05	0.04	0.05
Total.....	$3.02	$4.32	$3.74	$3.32	$3.01
Distribution of Total Income					
Cents per pound (metal):					
Marketing cost.....	1.6¢	2.1¢	1.7¢	3.0¢	2.5¢
Operating cost.....	7.7¢	9.5¢	11.3¢	10.7¢	12.5¢
Total cost.....	9.3¢	11.6¢	13.0¢	13.7¢	15.0¢

Premium Price Plan

JESSE L. MAURY, Consulting Engineer, Washington, D. C.

THE ACCOMPANYING TABLES and an extended discussion of them were recently prepared at the request of Senator McCarran of Nevada. They summarize the principal elements of production, costs, income, and operating margins of various groups of mines reporting under the Premium Price Plan, separated (ex Tri-State) into mines producing less than 5,000 tons of recoverable metal a year and those with larger production.

The tables show a substantial increase in costs per pound of metal during the period reviewed, due to the lower grades of ore mined. That operating efficiency at the mines was reasonably maintained is, however, indicated by the much lesser rise in operating costs per ton of ore in the Tri-State and their general decline in other groups as mass mining came into play.

The strong emphasis on zinc ores at medium-sized lead-zinc mines outside the Tri-State is illustrated by the declining lead-silver grade. Grades and tonnages mined in 1945 are probably indicative of ores which would be left in place at these mines in a normal open market and selective mining.

"Marketing costs" include all costs other than mining and milling. Most of these costs vary in proportion to market price, while premiums have been paid direct to mine operators. In order to translate premium income into equivalent market price it is, therefore, necessary to correct for the percentages which would be absorbed in marketing costs if the same income were to be obtained from the open market. These percentages, for example, are 50% for complex lead-zinc ores, 22% for ores from medium-sized copper mines, 18% for small copper mines, and 28% for the Tri-State. These percentages, plus corrections for cost changes since 1945, have been used in preparing the last table which shows the estimated present open market prices necessary to sustain production at these groups of mines.

Unless these prices are obtained, or unless the Premium Price Plan is extended, it appears that virtual closure of the Tri-State district will occur, that many other mines will have to cease operations, and that many more will be forced to return to highly selective mining in order to survive.

Output, Costs, Revenue and Operating Margins of Mines Receiving Premium Payments (*Continued*)

Medium-Sized Copper Mines (*Continued*)

	1941	1942	1943	1944	1945
Less—gold, silver and lead—zinc credits	1.0¢	1.2¢	1.7¢	1.2¢	2.1¢
Net cost	8.3¢	10.4¢	12.0¢	12.5¢	12.9¢
Operating margin	3.8¢	2.3¢	2.2¢	2.5¢	2.8¢
Gross market value plus premiums	12.1¢	12.7¢	14.2¢	15.0¢	15.7¢
Less—premiums	0	0.7¢	2.2¢	3.0¢	3.7¢
Gross market value	12.1¢	12.0¢	12.0¢	12.0¢	12.0¢
Dollars per ton (ore):					
Gross market value	$3.02	$4.32	$3.74	$3.32	$3.01
Marketing cost	0.36	0.71	0.50	0.74	0.53
Market revenue	2.66	3.61	3.24	2.58	2.48
Premium revenue	0.00	0.22	0.66	0.72	0.78
Total revenue	2.66	3.83	3.90	3.30	3.26
Operating cost	1.78	3.06	3.27	2.68	2.68
Operating margin	0.88	0.77	0.63	0.62	0.58

COPPER MINES UNDER 5000 TONS PER YEAR

	1941	1942	1943	1944	1945
Number of mines reporting	7	13	24	27	35
Production of Reporting Mines					
Thousands of tons, ore	621	2,025	3,731	6,309	6,477
Thousands of tons, copper	7.8	26.0	41.8	54.7	49.0
Percentage of U. S. total	0.8	2.4	3.8	5.5	6.4
Grade of Ore					
Percent, copper	1.26	1.26	1.12	0.87	0.76
Ounces, silver	0.12	0.21	0.29	0.18	0.07
Ounces, gold	0.002	0.006	0.004	0.003	0.002
Distribution of Value per Ton					
Copper	$3.02	$3.02	$2.69	$2.08	$1.83
Silver	0.09	0.15	0.21	0.13	0.05
Gold	0.07	0.21	0.14	0.16	0.07
Lead—zinc credit	0.00	0.13	0.07	0.04	0.06
Total	$3.18	$3.51	$3.11	$2.41	$2.01

Copper Mines Under 5000 Tons per Year (*Continued*)

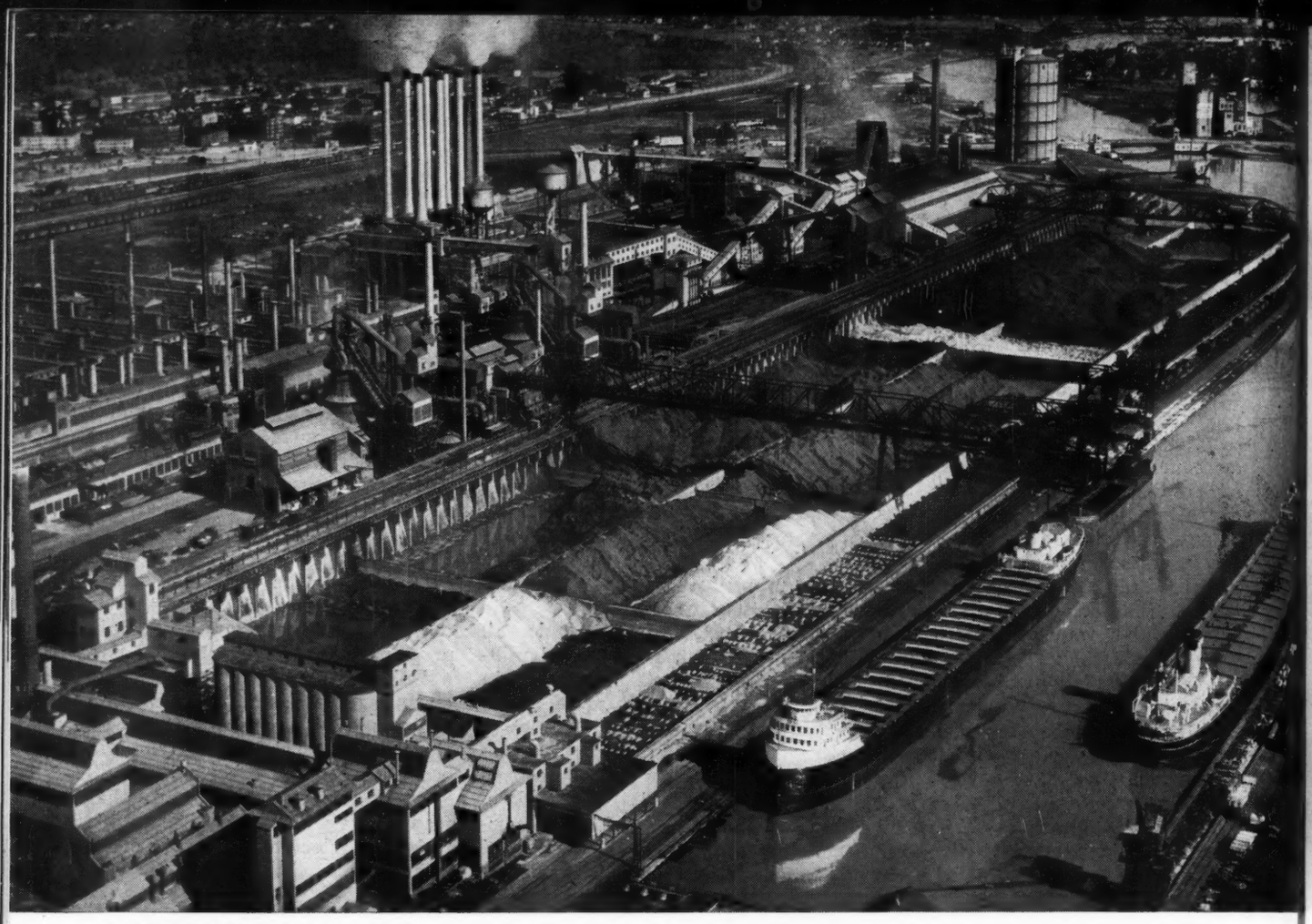
Distribution of Total Income

	1941	1942	1943	1944	1945
Cents per pound (metal):					
Marketing cost	3.6¢	2.6¢	3.0¢	2.9¢	3.1¢
Operating cost	8.7¢	14.8¢	16.3¢	15.6¢	16.6¢
Total cost	12.3¢	17.4¢	19.3¢	18.5¢	19.7¢
Lead—gold, silver and lead—zinc credits	0.6¢	2.0¢	1.9¢	1.9¢	1.2¢
Net cost	11.7¢	14.5¢	17.4¢	16.6¢	18.5¢
Operating margin	0.4¢	(0.8¢)	2.0¢	2.6¢	1.9¢
Gross market value plus premiums	12.1¢	14.6¢	19.4¢	19.2¢	20.4¢
Less—premiums	0	2.6¢	7.4¢	7.2¢	8.4¢
Gross market value	12.1¢	12.0¢	12.0¢	12.0¢	12.0¢
Dollars per ton (ore):					
Gross market value	$3.18	$3.51	$3.11	$2.41	$2.01
Marketing cost	0.91	0.66	0.66	0.50	0.47
arket revenue	2.27	2.85	2.45	1.91	1.54
Premium revenue	0.00	0.64	1.60	1.21	1.24
Total revenue	2.27	3.49	4.05	3.12	2.78
Operating cost	2.18	3.70	3.60	2.67	2.50
Operating margin	0.09	(0.21) loss	0.45	0.45	0.28

COMPOSITE PRICE REQUIREMENTS

	Base-Metal Avg. Ratios	Present Price (Same Ratios)*	Est. Avg. Price Req. to Sustain Current Production
Tri-State	82 Zn, 18 Pb	11.3¢	15.9¢
Medium lead-zinc	74 Zn, 26 Pb	11.65	12
Small lead-zinc	61 Zn, 39 Pb	12.2	17
Medium copper	.....	21.5	18.7
Small copper	.....	21.5	23.7

* @ 10.5¢ Zn, 15.0¢ Pb.



CONCENTRATION OF LAKE ORES can answer the ore-supply problem of our great steel plants for many generations. Here we have the docks, stockpiles, furnaces, and steel mills included in Ford Motor Co.'s giant River Rouge plant near Detroit, Mich. Storage capacity is 2,000,000 tons of iron ore, limestone, and coal. The blast furnaces take 1,500 tons of iron ore per 24 hours.

Technology Will Solve Our Iron-Ore Problems

CARL ZAPFFE, Manager, Iron-Ore Properties, Northern Pacific Railway, Brainerd, Minn.

MANY PEOPLE who do not understand the qualifications surrounding the term "reserves" as used by the mining industry have undertaken to interpret our mineral-resource position in the popular press. These people have popularized the term "have-not" applied to nations and have urged that we should depend principally on imported ores. As a result the public in general now reacts as if the United States were a "have-not" nation and has adopted the view that our iron-ore reserves are near exhaustion. Also, men well acquainted with the facts have stated that at the present rate of production the Lake Superior reserve of high-grade ore would probably become exhausted in 8 to 12 years. All too commonly the layman has accepted this statement to mean that our reserves of iron ore are all but gone. The fear of a resultant, serious, economic upheaval was helped along by the requests made, in all sincerity, by another group of men that a few hundred million tons of iron ore be stockpiled, or somehow be set aside for use only in case of future emergency. Obviously, the emergency they visualize is a third world war.

In 1907 a Swedish investigator of iron-ore resources claimed that the Lake Superior reserves would be exhausted in a few years, 20 perhaps. I was asked by C. K. Leith to compile data for him to refute that statement. Leith then declared that because promising explorable ground was still very extensive, there was no need for alarm and a long life lay ahead. In 1925 a similar furor arose, but this time the alarmists were men of our own steel industry. They had estimated a Lake Superior ore reserve likely to

become exhausted in about 1945, or, possibly, under particularly favorable circumstances, to suffice to 1960. This short life I refuted, mainly by pointing out the error in their mathematical methods.* I regarded 50 years as a minimum period. They had ignored experiences regarding new increments, some due to discoveries, some arising from improvements in extraction, and some arising from changes in the ways of estimating.

Now we are confronted by another furor, occasioned not by men in the industry but by outsiders misinterpreting figures on reserves. My basis for disagreement this time is based on their disregard of the current intensive research pertaining to new beneficiation processes and new types of mining equipment.

Technology Is Resourceful

Ever since 1904 I have been grappling with iron-ore problems, especially those of the Lake Superior region. At the start of this career no beneficiation plant existed in this region. Washing was being tried experimentally in 1903, but it was not until 1910 that the first plant was built. That structure was erected near the west end of the Mesabi Range and was deemed the final answer to beneficiation problems. All other methods proposed for a long time afterwards were ridiculed by operators or were regarded as unsuitable.

In spite of every contrary opinion expressed through the years since 1903, one may see today most of these tabooed methods operating as indispensable features of the flowsheet in a combination mill. We have washing and jigging, heavy-density separation, drying in kilns, and sintering. We have seen magnetic roasting and magnetic separation used, and we know it works. Tailings re-treatment was derided, but tailings are now looked upon as usable. Flotation was long held up to scorn, but much current experimentation favors making it an essential adjunct in the flowsheets of new plants. This type of study goes on far more vigorously today than at any time in the past. One cannot stop the urge to do research work, even though the adoption of its findings may lag far behind. Research, as never before, characterizes this decade.

Solution of the iron-ore problem

* August 1925 meeting of Lake Superior Mining Institute.

CARL ZAPFFE

is not a political or legislative matter. Through all the years the mining industry—or call it the steel industry, now that vertical integration prevails—has moved along at its own pace unhindered by the proclamations of politicians. It has always done what needed to be done at the proper time to assure a longer life. It went at the problems in its own way and solved them. The huge size of the steel industry—being virtually the backbone of the nation's economy—puts it beyond the pale of the spasmodic efforts of inexperienced people. It will not let its own life cease, and, therefore, it builds its muscle from the available fodder at the time of need. It rolls along and makes its path as it goes.

I have often remarked that about every seven years a new important step in beneficiation of iron ores has become common practice. These steps have crept in gradually and almost imperceptibly. It takes about seven years for them to develop to the point of usefulness and convince other operators that the developments are useful. These improvements came as a surprise when first seen in actual use, but many years of testing have preceded adoption. The advantages demonstrated where beneficiation has been tried have now overcome all opposition about adopting it. Also, application has been extended on the Mesabi Range alone over a distance of nearly one hundred miles. It was long a fixed view that beneficiation was of local use only at the extreme western end of that long district.

Although, in the first plant erected, a crude ore amenable to concentration had to be a sandy ore, for the plant of today it is not a matter of whether the crude is sandy or not, soft or hard, granular or slabby. Today, if a company needs more ore it goes out and makes it. Producing iron ore has become a manufacturing industry. The alarm being spread that the good concentrating ores are all but gone means that the days of the simplest process are just about gone. The fact that the reserves of what were formerly classed "possible wash-ores" are experiencing deep inroads, means that supplementary handling and treatment methods are meeting the problems of that type of material. In short, experience has demonstrated that it is foolish to ascribe limits to the future progress of technology in making low-grade material commercially usable.

Consumption Figures Exaggerated

Before the First World War the annual production of Lake Superior ore was within a range of thirty to forty million tons. The needs of that war boosted requirements to sixty-six million. After the war and up to 1930 production ranged from twenty-two to sixty-six million, but the twenties can be labeled as a fifty-million-ton decade. The 30's should be measured as a twenty-five-million decade, and many times experienced men of the industry then said that henceforth forty-five million tons would be big years. The day of stabilization was presumed to have been reached!

Then came the Second World War. With 1940 up went production successively by years to sixty-four, eighty, ninety-three, and then down to eighty-five, eighty-one, and in 1945 seventy-six million tons. For 1946 it was sixty-one million tons and for 1947 the goal is seventy-five million. Alarmists have carelessly used one-hundred million tons as a measure for war production. Because, they say, so much ore can be produced only by pit-mining and there is a reserve of open-pit ore of only six-hundred million tons, the United States will be in jeopardy in six years. Something must be done at once, they proclaim.

If after the First World War we dropped production from a sixty-million figure to a forty-five or less, may we not assume that our eighty-million average for the Second World War will see a shrinkage to about sixty million, or the equivalent of 1946 production? Sixty mil-

lion is considerably less ore than the hundred million tons used with so much abandon in amateurish prognostications, and the change will affect calculations substantially. However, such a premise does not solve the fundamental problem.

Great Reserve Exists

In estimating ore reserves it is customary to use the total tonnage on which taxes are levied by the states. This total was about 1.5 billion tons in 1920. Twenty-five years later (1945) it was listed at 1.2 billion tons. The average annual shipment during that time has been about 50,000,000 tons, but the average annual shrinkage has been only 12,000,000 tons. This is accounted for by additions, either as new deposits, as extensions in existing mines, or as additions due to new methods which made poorer crude materials usable. Such sources of error in forecasting have always been with us and are destined to appear on a scale far larger than ever before.

In 1910 the International Geological Congress met in Stockholm, Sweden. To commemorate that meeting, two large volumes were published that dealt with the iron resources of the world. For every geographical division, a person familiar with the local occurrences of iron-bearing material submitted a statement and an estimate. For the United States the four men best posted in those years about our iron ores were C. R. VanHise, C. K. Leith, C. W. Hayes, and J. F. Kemp. They collaborated, and Kemp wrote the report.

For the Lake Superior region they compiled (in 1908-09) a total of 72,000,000,000 tons of iron-formation to a very conservative mining depth and averaging about 40% in iron. This was offered as a potential reserve, with the possibility of about 250 billion if the content were set at 35 to 40% and a greater depth used. This is a stupendous reserve. It was a time in the industry when washing the excellent western sandy ores of the Mesabi Range had hardly been adopted as feasible. We see, therefore, that even thirty-eight years ago, at the very beginning of the time that marks treating the easiest of Lake ores, the big bulk of Lake Superior ore formation—regardless of density, physical toughness, degree of oxidation, and details of chemical composition—was represented to the world as a foundation and a safeguard of an expanding iron and steel industry, leading the world in output for a very long time.

Since 1910 a few people have attempted to compile tonnages of future reserves of the different countries. Although estimators vary in their interpretations as to what is acceptable and vary, also, in their appraisals about fitnesses, none to my knowledge has ever successfully challenged Kemp's statement or upset his prognosticated figures about the Lake Superior reserves. The total is so very big that one need not quibble. For instance, let us be conservative and cut Kemp's reserves to only 60,000,000,000 tons. Then, conservatively again, assume that over the many years from now on all the processes to be used will require on an average three tons of crude to make one of concentrate. That produces 20,000,000,000 tons of concentrates. Also, it must not be overlooked that these concentrates will represent more iron units per ton than our best direct ores or concentrates of today. This is far from being a "have-not" nation!

Even if we grant that the alarmists are somewhere near correct when they speculate on a future annual production of 100,000,000 tons per year, we will then have a life of 200 years for our reserves. These considerations take no account of the enormous addition to reserves if we lower the average grade to 35% or increase the minable depth within reasonable limits. Furthermore, to the extent that imported ore tonnage will tend to increase, it will have a lengthening effect on the life of Lake Superior reserves.

Future Concentrating Plants

Never, since mining was begun in the Lake Superior region, have the major companies been devoting so much time, effort, and money toward developing the best way to use the type of rock that composes this huge reserve. The major companies are all working at this problem, not to come in first in a race, but because all intend to participate in this mining for a long, long time. All the big consumers of ore recognize that this great reserve of low-grade Lake ore must be used, and are aiming toward that end. They are not only applying their skill to raising iron content, but to such other matters as type of ore minerals and resultant slag minerals, size of grain, degree of fineness after crushing and grinding, reagents for flotation or depression, natural or pre-roast magnetic concentration, and various ways of agglomerating. Conveying at the mine, and probably even changes in subsequent transportation, will become a part of the study.

The problem of taxation by the State of Minnesota was settled first by tax concessions designed to encourage taconite development. It is, all in all, the most vigorous and most determined attack ever made. One should not attempt to base pessimism on an alleged cost-per-ton basis. These costs can be improved, and the steel industry can adjust itself to the necessary costs.

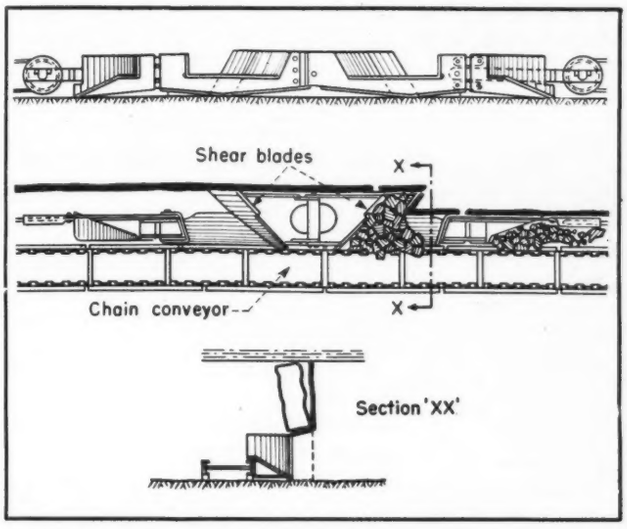
One Million Tons Per Unit

The unit plant already in prospect and designed to handle this refraction material, is expected to produce one million tons of concentrates per year. Tentatively, certain followers of the problem contemplate that there should be twenty units scattered over the eastern half of the Mesabi, just as a starter. If three tons of crude ore are to be required per ton of concentrate, then the twenty million tons will need sixty million tons of crude ore; and if that rate is continued for 30 years, it would require a supply of only 1,800,000,000 tons of crude ore. If the Lake region is henceforth to supply each year an average of 60,000,000 tons of shipping ore, and if only 20,000,000 tons of it is going to be concentrates, then 40,000,000 tons must be obtained as direct ore taken from pits and underground mines. The present taxed reserve of 1.2 billion tons of shipping ore would then last 30 years.

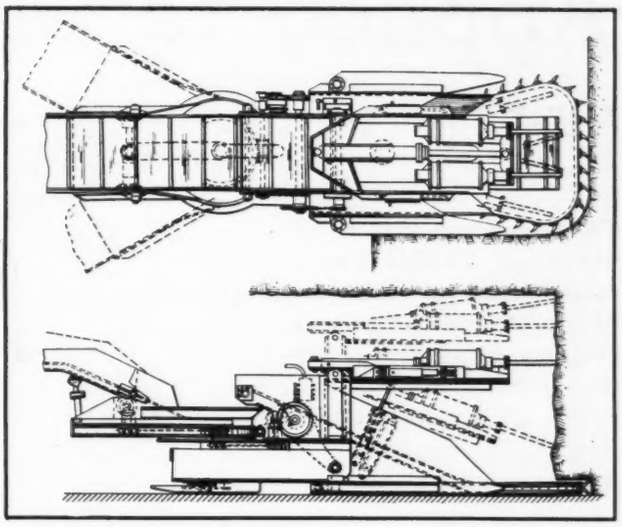
Except that cost of the plants may become too great, there may be no limit to the number of plants to be built, nor need the size be limited to an annual capacity of one million tons of concentrates. Output can be made three million tons and thereby use more each year of the abundant low-grade reserve and less of the taxed reserve of direct-shipping ore, thereby doubling the life of the latter.

Thus, in view of the enormous tonnages of low-grade ore susceptible to concentration, and the demonstrated ability of the steel industry to solve its own problems, it seems unrealistic for the public to worry about our iron-ore reserves.

Take a Look at Coal Mining



COAL PLANER BLADE cuts slices off face. Broken material is cast up on chain conveyor. Another type uses pneumatic chisels.

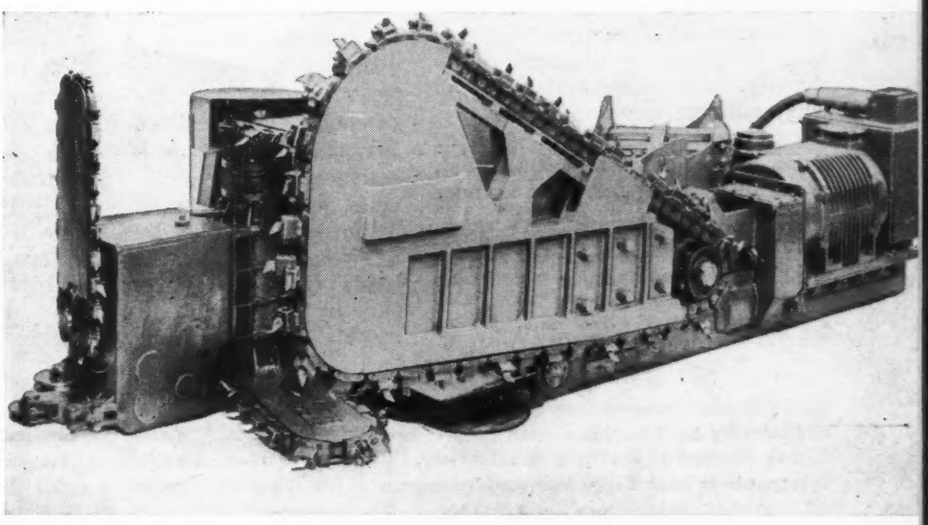


PRESSURE AND VIBRATION create resonance which breaks down coal. This Konnerth machine also undercuts and loads coal.

MINERS OF SOFT MATERIALS, like salt, potash, clay, sulphur, and bauxite, may profit by paying attention to some recent developments in coal mining. According to *Coal Age* (Mar., p. 65 & June, p. 89), several machines, which eliminate drilling and blasting, have been devised to cut manpower requirements and save the time of changing equipment at the face, thus effecting an uninterrupted cycle of mining.

The coal planer, developed by the Germans during the war and described in U. S. Bureau of Mines Information Circular No. 7377, is soon to be tested in the anthracite fields. Operating like a large-scale version of a carpenter's plane, it is dragged along the lower part of the face by a wire cable and cuts a slice of coal about half the seam width and one foot deep. A plow-like device casts the coal on to a chain conveyor installed parallel to the face. The upper, remaining portion of the seam then caves, or is barred down. On its return trip, the planer "plows" this loosened material on to the belt. One design has a simple blade to do the cutting. Another has a series of pneumatic chisels installed in the cutting edge.

Another "family" of devices uses cutter bars similar in principle to those commonly used for undercutting, except that cutting in four planes, they saw out large chunks of the coal seam. The Logan slab



LOGAN SLAB CUTTER carries one undercutting bar, one overcutting bar, one shearing bar, and a severing bar which rotates into the face to cut blocks loose.

cutter shown here has four cutter bars which undercut, overcut, shear, and sever a block of coal from the face.

The "Julian" machine, developed in Vincennes, Ind. has two swinging undercutting arms and two swinging digging arms. The cutting edges of the digging arms and a central digging tool are all fitted with air-operated chisels. The machine also loads the loosened coal.

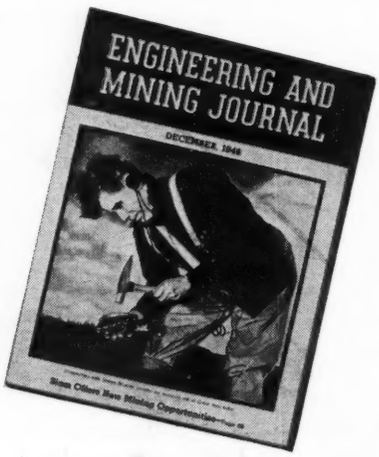
Another device, of possible interest also to hardrock miners, shatters the coal by high-frequency vibrations and undercutting. Patented by K. L. Konnerth of H. C. Frick Coke Co., the machine sets up resonance in the coal through two hammers pressed against the face by hydraulic or air cylinders.

Some metal miners are also showing increased interest in the high-capacity type of loading machines used in coal mining. Several of these have been standard equipment in soft-rock non-metallic mining for some time. Now it seems likely that metallurgical development of recent years can overcome the abrasion problems that caused disappointment in testing these loaders in hard-rock mines.

Illustrations courtesy *Coal Age*.

Geiger-Mueller Counters Applied to Mining

A. W. KNOERR, Associate Editor



Following publication of this cover on *E.&M.J.*, Dec. 1946*, many readers sent inquiries about Geiger-Mueller radiation counters. This article describes the operating principle and use of the equipment, and includes information supplied by designers, manufacturers, and users of various units.

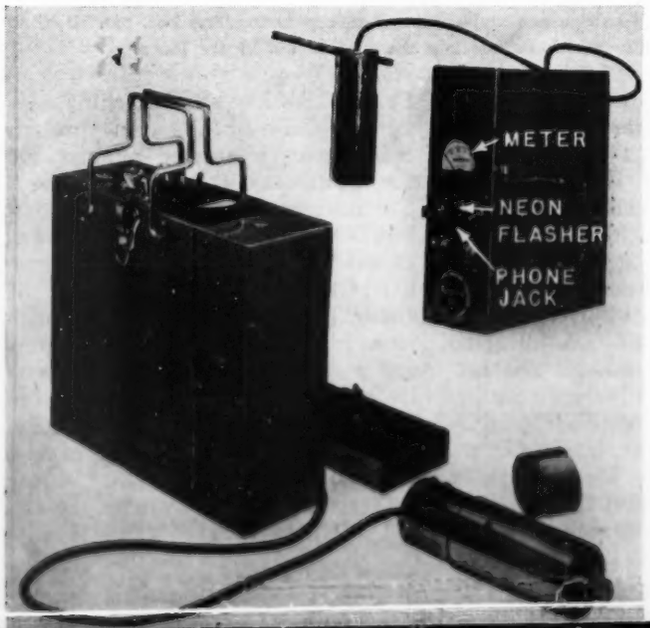
AS GEIGER-MUELLER equipment is used to detect or measure radioactivity, it is important to recall what radioactivity is before studying the operating principle and the applications of the equipment. When unstable atoms, such as those of uranium, thorium, or radium, disintegrate, they may emit three types of rays: alpha, beta, and gamma. This phenomenon may be demonstrated by placing a radioactive substance in a strong magnetic field. Alpha rays, which are helium nuclei, will be bent in one direction; beta rays, which are negatively charged electrons, will be bent in the opposite direction; and gamma rays, which are similar to X-rays, will remain unbent. Alpha and beta rays are also referred to as atomic particles. Substances which give off all or some of these rays are said to be radioactive.

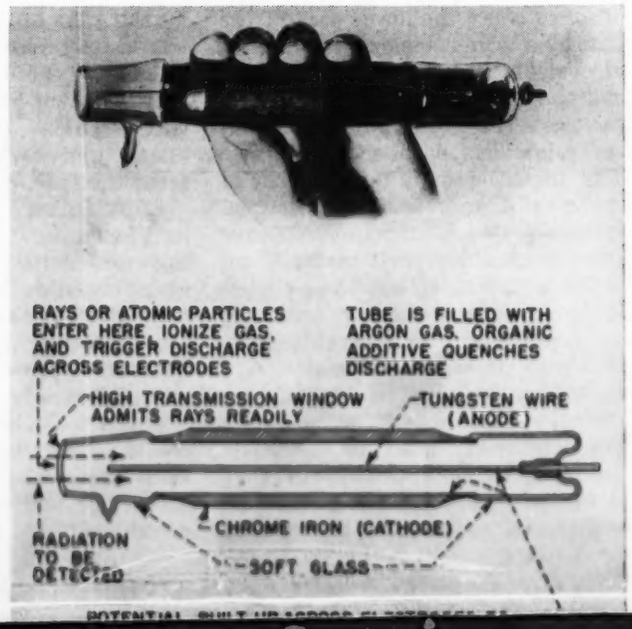
The penetrating power of these rays varies. Alpha rays are blocked by aluminum foil 0.1 mm. thick, and most beta rays by a sheet of aluminum 1 cm. thick. Gamma rays, however, can penetrate relatively thick layers of metal and materials of low atomic weight. Consequently the gamma rays are easiest to detect or count, because they are not as likely to be stopped as are the two others.

When these rays or atomic particles strike certain gases under proper conditions they ionize them, thus making conductors out of the gases. This principle is used in the Geiger-Mueller tube, which usually consists of an envelope filled with a suitable gas, and contains two electrodes as shown. A high potential is impressed across the electrodes—just high enough to almost, but not

* This is a GP-8 prospector's model, developed by Dr. Walter Hushley, of the National Research Council, Canada, and his assistants. Electronic Associates, Ltd., and Electronic Devices, Ltd., both manufacturing firms in Toronto, have subsequently acquired circuit diagrams from NRC.

This portable, battery-powered Geiger counter indicates radiation intensity by headphone, neon flasher, and meter deflection. It may be used in the field or laboratory. With cap in place, it responds to hard X-rays and gamma rays; with cap removed, it responds to soft X-rays and high-energy-level beta rays. The sleeve can be pushed forward for directional scanning. Construction and operating principle of a Geiger-Mueller tube are shown at right. Courtesy North American Philips Co.




RAYS OR ATOMIC PARTICLES ENTER HERE, IONIZE GAS, AND TRIGGER DISCHARGE ACROSS ELECTRODES
TUBE IS FILLED WITH ARGON GAS. ORGANIC ADDITIVE QUENCHES DISCHARGE
HIGH TRANSMISSION WINDOW ADMITS RAYS READILY
TUNGSTEN WIRE (ANODE)
CHROME IRON (CATHODE)
SOFT GLASS
RADIATION TO BE DETECTED

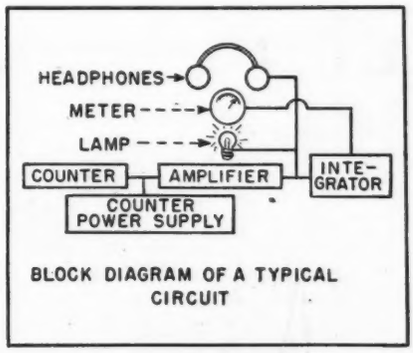
quite, cause a brush discharge. When an atomic particle or ray enters the tube, it knocks electrons off of the gas atoms, thus ionizing the gas and permitting a discharge across the electrodes. This electrical impulse is amplified electronically, and may be registered as a click in an earphone, a flash in a small neon lamp, or by the deflection of a meter needle. (See adjacent diagram.) Some units register and count the number of discharges; others register the average rate of discharges. Usually intensity of radiation is measured by counting the number of pulses. Intensity can also be measured by average meter deflection. Tubes may be designed to be triggered off by gamma radiation, hard X-rays, soft X-rays, beta radiation, alpha radiation, and neutrons.

Geiger tubes vary in design, depending upon the sensitivity and ruggedness required. In some tubes, both electrodes are inclosed in a glass envelope. In others, one electrode forms a part of the envelope. (See illustration.) The envelope may also be constructed of aluminum, brass or other metal. In some tubes a thin window of beryllium, mica, or Lindemann glass comprises one end of the envelope to admit radiation more readily. In others, a shield of lead or aluminum may be used to exclude certain forms of radiation.

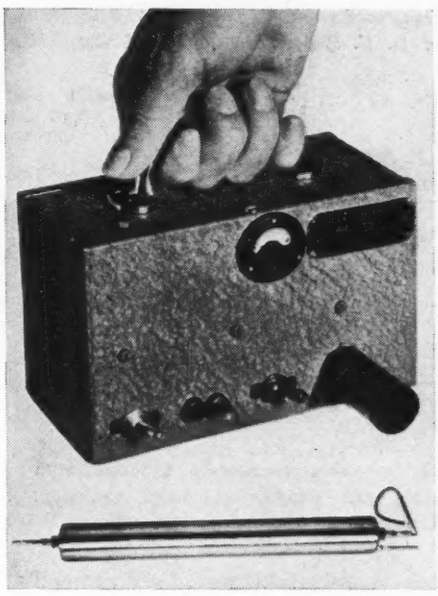
Rare Gases Fill Tubes

Tubes are generally filled with a rare gas such as helium, argon, or krypton, at a fraction of atmospheric pressure. Ethyl alcohol, or some other suitable organic additive, is often provided to make the tube self-quenching. For prospecting, the count obtained ranges between 20 to 200 per minute. Specialized laboratory equipment for X-ray analysis of minerals will register up to several thousand counts per second. Several manufactured portable units suitable for field examination and determining radioactivity of ore specimens or samples are illustrated.

The next question of importance to mining men is: What minerals or rocks are radioactive? Strangely enough, virtually all rocks are radioactive to some degree because they contain minute quantities of radioactive elements. Radioactive rocks (caused by the presence of radium and thorium) are listed in the accompanying table. Other elements which are naturally radioactive according to the International Table of Radioactive Elements[1] are: uranium, actinium, potassium, and rubidium. Zirconium is mentioned in other references. The degree of radioactivity of these elements and their isotopes varies widely.



BLOCK DIAGRAM OF A TYPICAL CIRCUIT



Portable radioactivity detector. All-metal tube is made in sizes ranging from ½-in. diameter and ½-in. long, to 3-in. diameter and 5 ft. long. Courtesy Geophysical Instrument Co.

Radioactive Contents of Typical Rocks*

	Content per Gram of Rock
Acid rocks	
Volcanic origin	3.1×10^{-12} g. radium
Plutonic origin	2.7×10^{-12} g. radium
Intermediary rocks	
Volcanic origin	2.1×10^{-12} g. radium and 3.5×10^{-6} g. thorium
Plutonic origin	1.9×10^{-12} g. radium
Basic rocks	
Volcanic origin	1.1×10^{-12} g. radium and 1.7×10^{-6} g. thorium
Plutonic origin	1.9×10^{-2} g. radium
Sedimentary rocks	
Clay	1.5×10^{-12} g. radium and 1.3×10^{-6} g. thorium
Sandstone	1.4×10^{-12} g. radium and 0.5×10^{-6} g. thorium
Limestone and dolomite	0.9×10^{-12} g. radium and 0.1×10^{-6} g. thorium

* According to Petraschak and Krusch. Mining Engineers' Handbook, by Peele, Third Edition, Page 10-A-41.

Minerals containing some of the elements are radioactive. Among them are: pitchblende, carnotite, autonite, roscoelite, torbennite, uvanite, uraninite, smaraskite, euxenite, monazite, and others. There are 55 uranium-bearing minerals alone. Concentrations of radioactive minerals occur in veins, such as those at Great Bear Lake, Canada; in sandstones and shales, such as in the deposits in Colorado and Utah; in pegmatites, such as those in South Dakota and New Mexico; and in coal, peat, and oil shale in certain areas[2]; and in thorium-bearing placer sands.

Gases, too, may be radioactive. For example, radon is a highly radioactive gas produced during the disintegration of radium and thorium It diffuses readily in soil, and may be detected even when extremely diluted. This fact is useful in geophysical prospecting.

Finally, certain springs containing radioactive elements demonstrate that liquids can also be radioactive. This phenomenon is significant for geologic and geophysical investigations.

Isotopes Will Be Useful

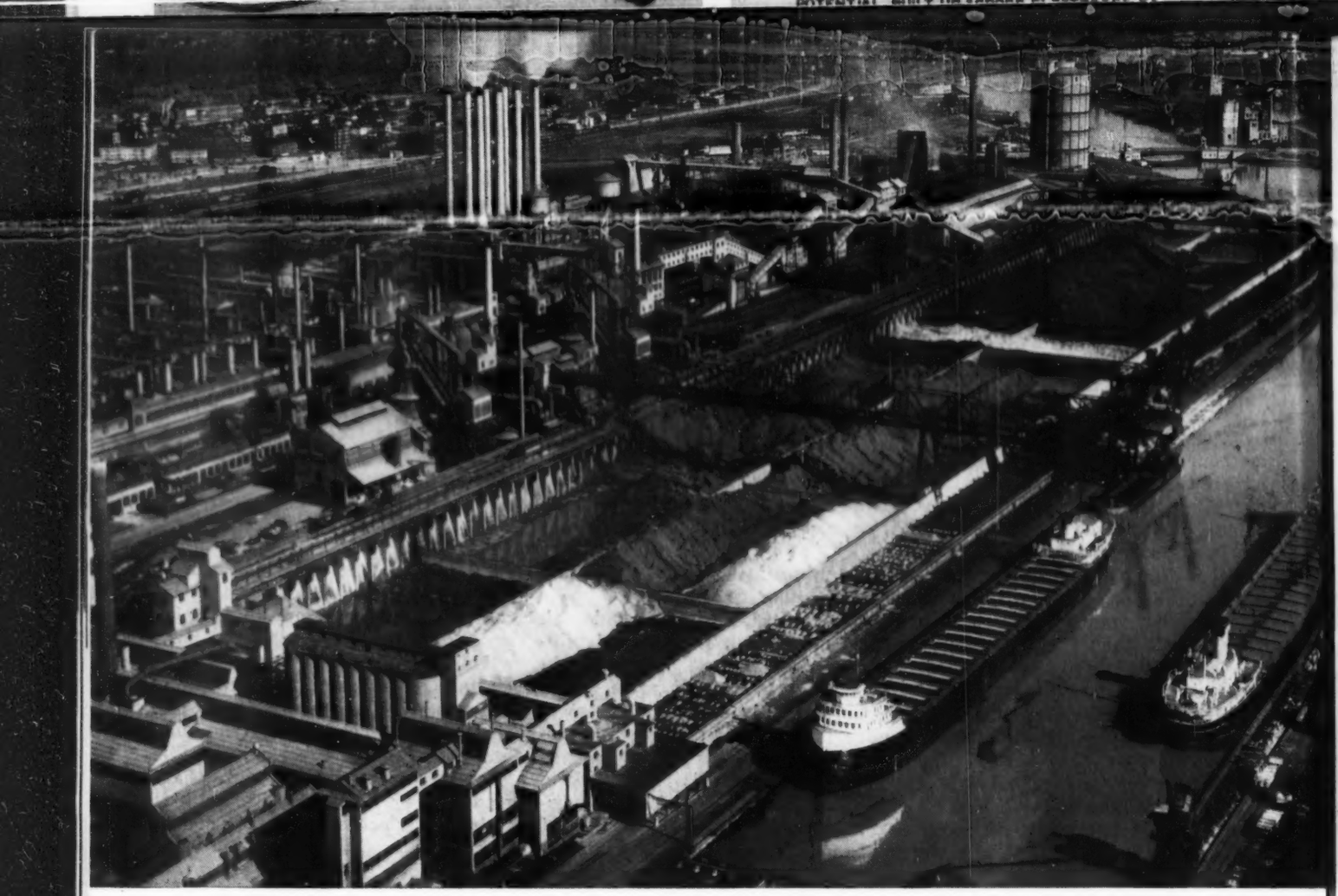
In reviewing the natural occurring radioactive substances mentioned, we must not overlook the artificial radioactive isotopes produced as an end product or a by-product of atomic fission. These tracers, which can be detected by Geiger tubes and photographic methods, will be increasingly useful in mining and metallurgy.

Finally, it is possible to induce radioactivity by bombarding rocks with neutrons, and then measuring the resulting gamma radiation. Data thus obtained may be useful for geologic study just as the fluorescence induced by an ultra-violet ray light is for mineral study.

As cosmic rays affect all Geiger tubes unless heavily shielded, this form of radiation must be properly evaluated. Cosmic rays are thought to be produced by atomic disintegration in interstellar space. They bombard the earth at all times and

[1] Handbook of Chemistry and Physics," Chemical Rubber Publishing Co.

[2] Uranium Supply Will Be Difficult to Control." E.&M.J., Sept. 1945.



CONCENTRATION OF LAKE ORES can answer the ore-supply problem of our great steel plants for many generations. Here we have the docks, stockpiles, furnaces, and steel mills included in Ford Motor Co.'s giant River Rouge plant near Detroit, Mich. Storage capacity is 2,000,000 tons of iron ore, limestone, and coal. The blast furnaces take 1,500 tons of iron ore per 24 hours.

Technology Will Solve Our Iron-Ore Problems

CARL ZAPFFE, Manager, Iron-Ore Properties, Northern Pacific Railway, Brainerd, Minn.

MANY PEOPLE who do not understand the qualifications surrounding the term "reserves" as used by the mining industry have undertaken to interpret our mineral-resource position in the popular press. These people have popularized the term "have-not" applied to nations and have urged that we should depend principally on imported ores. As a result the public in general now reacts as if the United States were a "have-not" nation and has adopted the view that our iron-ore reserves are near exhaustion. Also, men well acquainted with the facts have stated that at the present rate of production the Lake Superior reserve of high-grade ore would probably become exhausted in 8 to 12 years. All too commonly the layman has accepted this statement to mean that our reserves of iron ore are all but gone. The fear of a resultant, serious, economic upheaval was helped along by the requests made, in all sincerity, by another group of men that a few hundred million tons of iron ore be stockpiled, or somehow be set aside for use only in case of future emergency. Obviously, the emergency they visualize is a third world war.

In 1907 a Swedish investigator of iron-ore resources claimed that the Lake Superior reserves would be exhausted in a few years, 20 perhaps. I was asked by C. K. Leith to compile data for him to refute that statement. Leith then declared that because promising explorable ground was still very extensive, there was no need for alarm and a long life lay ahead. In 1925 a similar furor arose, but this time the alarmists were men of our own steel industry. They had estimated a Lake Superior ore reserve likely to

become exhausted in about 1945, or, possibly, under particularly favorable circumstances, to suffice to 1960. This short life I refuted, mainly by pointing out the error in their mathematical methods.* I regarded 50 years as a minimum period. They had ignored experiences regarding new increments, some due to discoveries, some arising from improvements in extraction, and some arising from changes in the ways of estimating.

Now we are confronted by another furor, occasioned not by men in the industry but by outsiders misinterpreting figures on reserves. My basis for disagreement this time is based on their disregard of the current intensive research pertaining to new beneficiation processes and new types of mining equipment.

Technology Is Resourceful

Ever since 1904 I have been grappling with iron-ore problems, especially those of the Lake Superior region. At the start of this career no beneficiation plant existed in this region. Washing was being tried experimentally in 1903, but it was not until 1910 that the first plant was built. That structure was erected near the west end of the Mesabi Range and was deemed the final answer to beneficiation problems. All other methods proposed for a long time afterwards were ridiculed by operators or were regarded as unsuitable.

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Consumption Figures Exaggerated

Before the First World War the annual production of Lake Superior ore was within a range of thirty to forty million tons. The needs of that war boosted requirements to sixty-six million. After the war and up to 1930 production ranged from twenty-two to sixty-six million, but the twenties can be labeled as a fifty-million-ton decade. The 30's should be measured as a twenty-five-million decade, and many times experienced men of the industry then said that henceforth forty-five million tons would be big years. The day of stabilization was presumed to have been reached!

Then came the Second World War. With 1940 up went production successively by years to sixty-four, eighty, ninety-three, and then down to eighty-five, eighty-one, and in 1945 seventy-six million tons. For 1946 it was sixty-one million tons and for 1947 the goal is seventy-five million. Alarmists have carelessly used one-hundred million tons as a measure for war production. Because, they say, so much ore can be produced only by pit-mining and there is a reserve of open-pit ore of only six-hundred million tons, the United States will be in jeopardy in six years. Something must be done at once, they proclaim.

If after the First World War we dropped production from a sixty-million figure to a forty-five or less, may we not assume that our eighty-million average for the Second World War will see a shrinkage to about sixty million, or the equivalent of 1946 production? Sixty mil-

lion is considerably less ore than the hundred million tons used with so much abandon in amateurish prognostications, and the change will affect calculations substantially. However, such a premise does not solve the fundamental problem.

Great Reserve Exists

In estimating ore reserves it is customary to use the total tonnage on which taxes are levied by the states. This total was about 1.5 billion tons in 1920. Twenty-five years later (1945) it was listed at 1.2 billion tons. The average annual shipment during that time has been about 50,000,000 tons, but the average annual shrinkage has been only 12,000,000 tons. This is accounted for by additions, either as new deposits, as extensions in existing mines, or as additions due to new methods which made poorer crude materials usable. Such sources of error in forecasting have always been with us and are destined to appear on a scale far larger than ever before.

In 1910 the International Geological Congress met in Stockholm, Sweden. To commemorate that meeting, two large volumes were published that dealt with the iron resources of the world. For every geographical division, a person familiar with the local occurrences of iron-bearing material submitted a statement and an estimate. For the United States the four men best posted in those years about our iron ores were C. R. VanHise, C. K. Leith, C. W. Hayes, and J. F. Kemp. They collaborated, and Kemp wrote the report.

For the Lake Superior region they compiled (in 1908-09) a total of 72,000,000,000 tons of iron-formation to a very conservative mining depth and averaging about 40% in iron. This was offered as a potential reserve, with the possibility of about 250 billion if the content were set at 35 to 40% and a greater depth used. This is a stupendous reserve. It was a time in the industry when washing the excellent western sandy ores of the Mesabi Range had hardly been adopted as feasible. We see, therefore, that even thirty-eight years ago, at the very beginning of the time that marks treating the easiest of Lake ores, the big bulk of Lake Superior ore formation—regardless of density, physical toughness, degree of oxidation, and details of chemical composition—was represented to the world as a foundation and a safeguard of an expanding iron and steel industry, leading the world in output for a very long time.

Since 1910 a few people have attempted to compile tonnages of future reserves of the different countries. Although estimators vary in their interpretations as to what is acceptable and vary, also, in their appraisals about fitnesses, none to my knowledge has ever successfully challenged Kemp's statement or upset his prognosticated figures about the Lake Superior reserves. The total is so very big that one need not quibble. For instance, let us be conservative and cut Kemp's reserves to only 60,000,000,000 tons. Then, conservatively again, assume that over the many years from now on all the processes to be used will require on an average three tons of crude to make one of concentrate. That produces 20,000,000,000 tons of concentrates. Also, it must not be overlooked that these concentrates will represent more iron units per ton than our best direct ores or concentrates of today. This is far from being a "have-not" nation!

Even if we grant that the alarmists are somewhere near correct when they speculate on a future annual production of 100,000,000 tons per year, we will then have a life of 200 years for our reserves. These considerations take no account of the enormous addition to reserves if we lower the average grade to 35% or increase the minable depth within reasonable limits. Furthermore, to the extent that imported ore tonnage will tend to increase, it will have a lengthening effect on the life of Lake Superior reserves.

Future Concentrating Plants

Never, since mining was begun in the Lake Superior region, have the major companies been devoting so much time, effort, and money toward developing the best way to use the type of rock that composes this huge reserve. The major companies are all working at this problem, not to come in first in a race, but because all intend to participate in this mining for a long, long time. All the big consumers of ore recognize that this great reserve of low-grade Lake ore must be used, and are aiming toward that end. They are not only applying their skill to raising iron content, but to such other matters as type of ore minerals and resultant slag minerals, size of grain, degree of fineness after crushing and grinding, reagents for flotation or depression, natural or pre-roast magnetic concentration, and various ways of agglomerating. Conveying at the mine, and probably even changes in subsequent transportation, will become a part of the study.

The problem of taxation by the State of Minnesota was settled first by tax concessions designed to encourage taconite development. It is, all in all, the most vigorous and most determined attack ever made. One should not attempt to base pessimism on an alleged cost-per-ton basis. These costs can be improved, and the steel industry can adjust itself to the necessary costs.

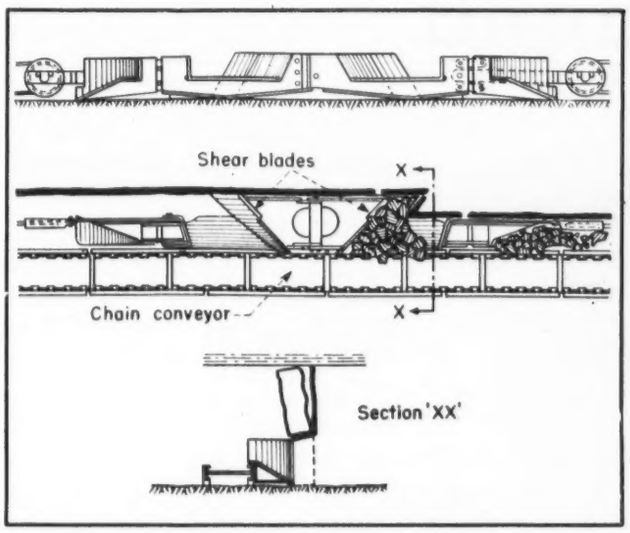
One Million Tons Per Unit

The unit plant already in prospect and designed to handle this refraction material, is expected to produce one million tons of concentrates per year. Tentatively, certain followers of the problem contemplate that there should be twenty units scattered over the eastern half of the Mesabi, just as a starter. If three tons of crude ore are to be required per ton of concentrate, then the twenty million tons will need sixty million tons of crude ore; and if that rate is continued for 30 years, it would require a supply of only 1,800,000,000 tons of crude ore. If the Lake region is henceforth to supply each year an average of 60,000,000 tons of shipping ore, and if only 20,000,000 tons of it is going to be concentrates, then 40,000,000 tons must be obtained as direct ore taken from pits and underground mines. The present taxed reserve of 1.2 billion tons of shipping ore would then last 30 years.

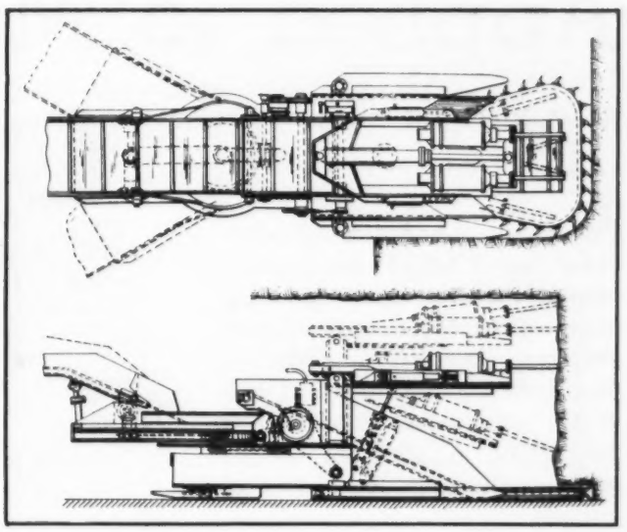
Except that cost of the plants may become too great, there may be no limit to the number of plants to be built, nor need the size be limited to an annual capacity of one million tons of concentrates. Output can be made three million tons and thereby use more each year of the abundant low-grade reserve and less of the taxed reserve of direct-shipping ore, thereby doubling the life of the latter.

Thus, in view of the enormous tonnages of low-grade ore susceptible to concentration, and the demonstrated ability of the steel industry to solve its own problems, it seems unrealistic for the public to worry about our iron-ore reserves.

Take a Look at Coal Mining



COAL PLANER BLADE cuts slices off face. Broken material is cast up on chain conveyor. Another type uses pneumatic chisels.

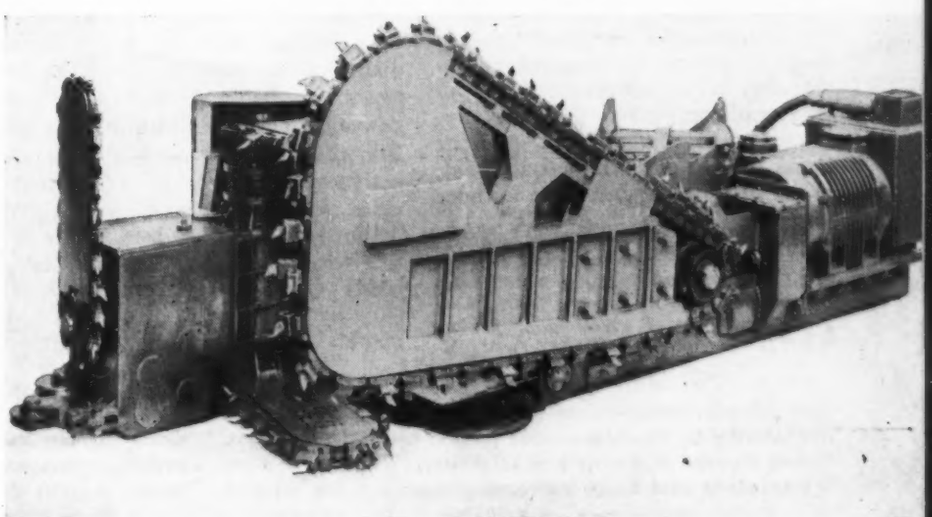


PRESSURE AND VIBRATION create resonance which breaks down coal. This Konnerth machine also undercuts and loads coal.

MINERS OF SOFT MATERIALS, like salt, potash, clay, sulphur, and bauxite, may profit by paying attention to some recent developments in coal mining. According to *Coal Age* (Mar., p. 65 & June, p. 89), several machines, which eliminate drilling and blasting, have been devised to cut manpower requirements and save the time of changing equipment at the face, thus effecting an uninterrupted cycle of mining.

The coal planer, developed by the Germans during the war and described in U. S. Bureau of Mines Information Circular No. 7377, is soon to be tested in the anthracite fields. Operating like a large-scale version of a carpenter's plane, it is dragged along the lower part of the face by a wire cable and cuts a slice of coal about half the seam width and one foot deep. A plow-like device casts the coal on to a chain conveyor installed parallel to the face. The upper, remaining portion of the seam then caves, or is barred down. On its return trip, the planer "plows" this loosened material on to the belt. One design has a simple blade to do the cutting. Another has a series of pneumatic chisels installed in the cutting edge.

Another "family" of devices uses cutter bars similar in principle to those commonly used for undercutting, except that cutting in four planes, they saw out large chunks of the coal seam. The Logan slab cutter shown here has four cutter bars which undercut, overcut, shear, and sever a block of coal from the face.



LOGAN SLAB CUTTER carries one undercutting bar, one overcutting bar, one shearing bar, and a severing bar which rotates into the face to cut blocks loose.

The "Julian" machine, developed in Vincennes, Ind. has two swinging undercutting arms and two swinging digging arms. The cutting edges of the digging arms and a central digging tool are all fitted with air-operated chisels. The machine also loads the loosened coal.

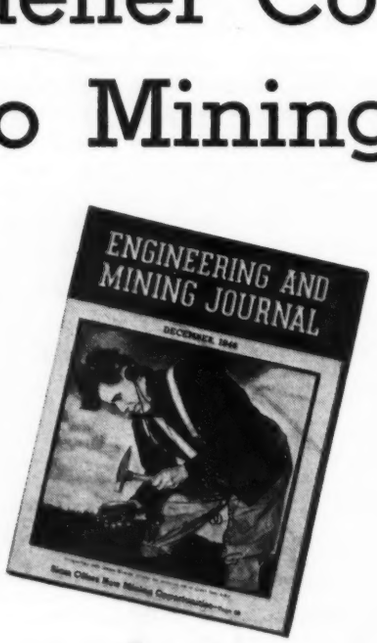
Another device, of possible interest also to hardrock miners, shatters the coal by high-frequency vibrations and undercutting. Patented by K. L. Konnerth of H. C. Frick Coke Co., the machine sets up resonance in the coal through two hammers pressed against the face by hydraulic or air cylinders.

Some metal miners are also showing increased interest in the high-capacity type of loading machines used in coal mining. Several of these have been standard equipment in soft-rock non-metallic mining for some time. Now it seems likely that metallurgical development of recent years can overcome the abrasion problems that caused disappointment in testing these loaders in hard-rock mines.

Illustrations courtesy *Coal Age*.

Geiger-Mueller Counters Applied to Mining

A. W. KNOERR, Associate Editor



Following publication of this cover on *E.&M.J.*, Dec. 1946*, many readers sent inquiries about Geiger-Mueller radiation counters. This article describes the operating principle and use of the equipment, and includes information supplied by designers, manufacturers, and users of various units.

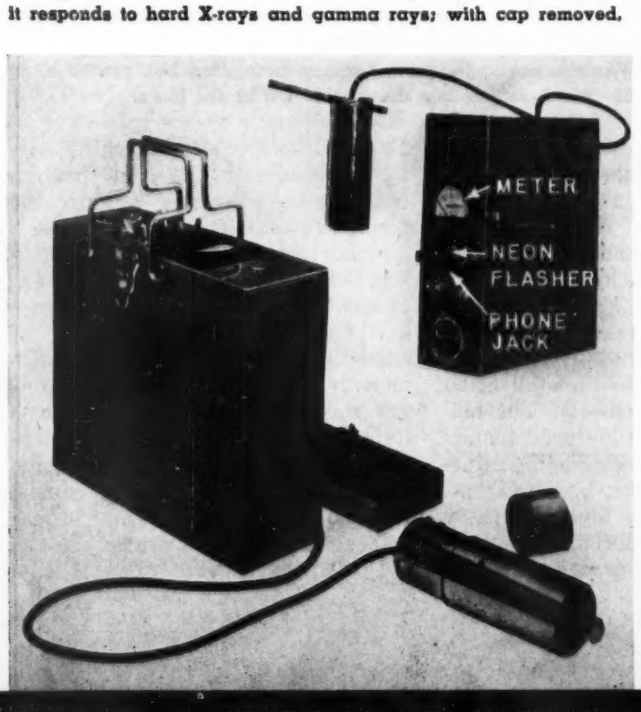
AS GEIGER-MUELLER equipment is used to detect or measure radioactivity, it is important to recall what radioactivity is before studying the operating principle and the applications of the equipment. When unstable atoms, such as those of uranium, thorium, or radium, disintegrate, they may emit three types of rays: alpha, beta, and gamma. This phenomenon may be demonstrated by placing a radioactive substance in a strong magnetic field. Alpha rays, which are helium nuclei, will be bent in one direction; beta rays, which are negatively charged electrons, will be bent in the opposite direction; and gamma rays, which are similar to X-rays, will remain unbent. Alpha and beta rays are also referred to as atomic particles. Substances which give off all or some of these rays are said to be radioactive.

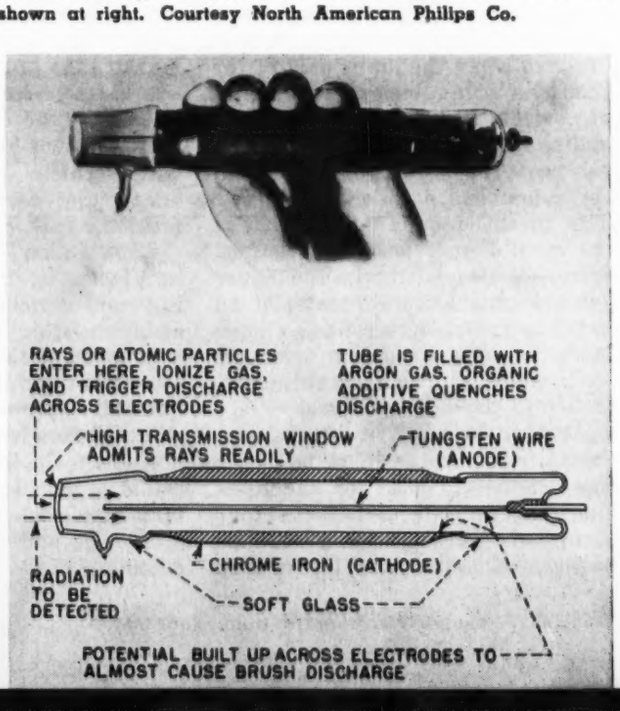
The penetrating power of these rays varies. Alpha rays are blocked by aluminum foil 0.1 mm. thick, and most beta rays by a sheet of aluminum 1 cm. thick. Gamma rays, however, can penetrate relatively thick layers of metal and materials of low atomic weight. Consequently the gamma rays are easiest to detect or count, because they are not as likely to be stopped as are the two others.

When these rays or atomic particles strike certain gases under proper conditions they ionize them, thus making conductors out of the gases. This principle is used in the Geiger-Mueller tube, which usually consists of an envelope filled with a suitable gas, and contains two electrodes as shown. A high potential is impressed across the electrodes—just high enough to almost, but not

* This is a GP-8 prospector's model, developed by Dr. Walter Hushley, of the National Research Council, Canada, and his assistants. Electronic Associates, Ltd., and Electronic Devices, Ltd., both manufacturing firms in Toronto, have subsequently acquired circuit diagrams from NRC.

This portable, battery-powered Geiger counter indicates radiation intensity by headphone, neon flasher, and meter deflection. It may be used in the field or laboratory. With cap in place, it responds to hard X-rays and gamma rays; with cap removed, it responds to soft X-rays and high-energy-level beta rays. The sleeve can be pushed forward for directional scanning. Construction and operating principle of a Geiger-Mueller tube are shown at right. Courtesy North American Philips Co.




RAYS OR ATOMIC PARTICLES ENTER HERE, IONIZE GAS, AND TRIGGER DISCHARGE ACROSS ELECTRODES
TUBE IS FILLED WITH ARGON GAS. ORGANIC ADDITIVE QUENCHES DISCHARGE
HIGH TRANSMISSION WINDOW ADMITS RAYS READILY
TUNGSTEN WIRE (ANODE)
CHROME IRON (CATHODE)
SOFT GLASS
RADIATION TO BE DETECTED
POTENTIAL BUILT UP ACROSS ELECTRODES TO ALMOST CAUSE BRUSH DISCHARGE

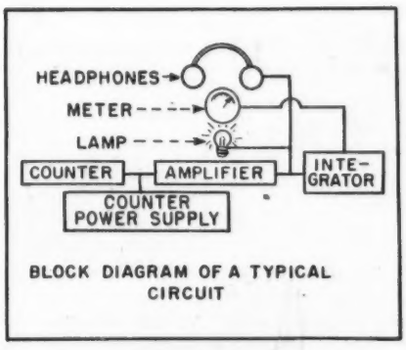
quite, cause a brush discharge. When an atomic particle or ray enters the tube, it knocks electrons off of the gas atoms, thus ionizing the gas and permitting a discharge across the electrodes. This electrical impulse is amplified electronically, and may be registered as a click in an earphone, a flash in a small neon lamp, or by the deflection of a meter needle. (See adjacent diagram.) Some units register and count the number of discharges; others register the average rate of discharges. Usually intensity of radiation is measured by counting the number of pulses. Intensity can also be measured by average meter deflection. Tubes may be designed to be triggered off by gamma radiation, hard X-rays, soft X-rays, beta radiation, alpha radiation, and neutrons.

Geiger tubes vary in design, depending upon the sensitivity and ruggedness required. In some tubes, both electrodes are inclosed in a glass envelope. In others, one electrode forms a part of the envelope. (See illustration.) The envelope may also be constructed of aluminum, brass or other metal. In some tubes a thin window of beryllium, mica, or Lindemann glass comprises one end of the envelope to admit radiation more readily. In others, a shield of lead or aluminum may be used to exclude certain forms of radiation.

Rare Gases Fill Tubes

Tubes are generally filled with a rare gas such as helium, argon, or krypton, at a fraction of atmospheric pressure. Ethyl alcohol, or some other suitable organic additive, is often provided to make the tube self-quenching. For prospecting, the count obtained ranges between 20 to 200 per minute. Specialized laboratory equipment for X-ray analysis of minerals will register up to several thousand counts per second. Several manufactured portable units suitable for field examination and determining radioactivity of ore specimens or samples are illustrated.

The next question of importance to mining men is: What minerals or rocks are radioactive? Strangely enough, virtually all rocks are radioactive to some degree because they contain minute quantities of radioactive elements. Radioactive rocks (caused by the presence of radium and thorium) are listed in the accompanying table. Other elements which are naturally radioactive according to the International Table of Radioactive Elements[1] are: uranium, actinium, potassium, and rubidium. Zirconium is mentioned in other references. The degree of radioactivity of these elements and their isotopes varies widely.



BLOCK DIAGRAM OF A TYPICAL CIRCUIT

Portable radioactivity detector. All-metal tube is made in sizes ranging from ½-in. diameter and ½-in. long, to 3-in. diameter and 5 ft. long. Courtesy Geophysical Instrument Co.

Radioactive Contents of Typical Rocks*

	Content per Gram of Rock
Acid rocks	
Volcanic origin	3.1×10^{-12} g. radium
Plutonic origin	2.7×10^{-12} g. radium
Intermediary rocks	
Volcanic origin	2.1×10^{-12} g. radium and 3.5×10^{-6} g. thorium
Plutonic origin	1.9×10^{-12} g. radium
Basic rocks	
Volcanic origin	1.1×10^{-12} g. radium and 1.7×10^{-6} g. thorium
Plutonic origin	1.9×10^{-2} g. radium
Sedimentary rocks	
Clay	1.5×10^{-12} g. radium and 1.3×10^{-6} g. thorium
Sandstone	1.4×10^{-12} g. radium and 0.5×10^{-6} g. thorium
Limestone and dolomite	0.9×10^{-12} g. radium and 0.1×10^{-6} g. thorium

* According to Petraschak and Krusch. Mining Engineers' Handbook, by Peele, Third Edition, Page 10-A-41.

Minerals containing some of the elements are radioactive. Among them are: pitchblende, carnotite, autonite, roscoelite, torbennite, uvanite, uraninite, smaraskite, euxenite, monazite, and others. There are 55 uranium-bearing minerals alone. Concentrations of radioactive minerals occur in veins, such as those at Great Bear Lake, Canada; in sandstones and shales, such as in the deposits in Colorado and Utah; in pegmatites, such as those in South Dakota and New Mexico; and in coal, peat, and oil shale in certain areas[2]; and in thorium-bearing placer sands.

Gases, too, may be radioactive. For example, radon is a highly radioactive gas produced during the disintegration of radium and thorium It diffuses readily in soil, and may be detected even when extremely diluted. This fact is useful in geophysical prospecting.

Finally, certain springs containing radioactive elements demonstrate that liquids can also be radioactive. This phenomenon is significant for geologic and geophysical investigations.

Isotopes Will Be Useful

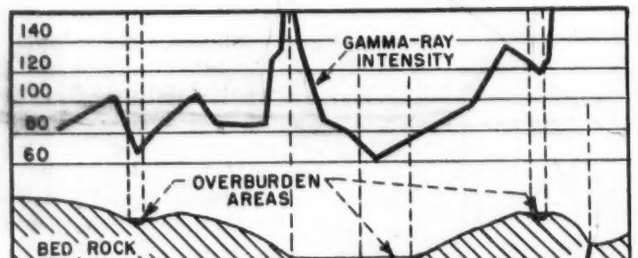
In reviewing the natural occurring radioactive substances mentioned, we must not overlook the artificial radioactive isotopes produced as an end product or a by-product of atomic fission. These tracers, which can be detected by Geiger tubes and photographic methods, will be increasingly useful in mining and metallurgy.

Finally, it is possible to induce radioactivity by bombarding rocks with neutrons, and then measuring the resulting gamma radiation. Data thus obtained may be useful for geologic study just as the fluorescence induced by an ultra-violet ray light is for mineral study.

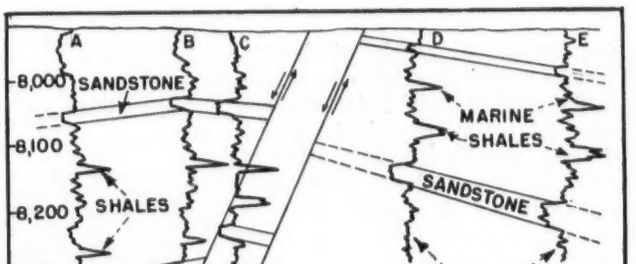
As cosmic rays affect all Geiger tubes unless heavily shielded, this form of radiation must be properly evaluated. Cosmic rays are thought to be produced by atomic disintegration in interstellar space. They bombard the earth at all times and

[1] Handbook of Chemistry and Physics," Chemical Rubber Publishing Co.

[2] Uranium Supply Will Be Difficult to Control." E.&M.J., Sept. 1945.



Profile of gamma-ray count with Geiger counter equipment over LaBine Point, Great Bear Lake, Canada. Pitchblende orebodies are in shear zones shown. Gamma-ray intensity exceeded capacity of instrument over No. 2 zone. After G. C. Ridland.[3]



Varied content of radioactive minerals in sandstone and shales enables oil geologists to correlate beds. Gamma-ray logs were obtained with ionization tube similar to Geiger tubes. After Jackson & Campbell.

from all directions. These rays trigger off a Geiger tube and produce a background count which varies at different altitudes, latitudes, and over and under different rock masses. The intensity of radiation may also vary as much as 30% from normal over a certain point. The rays may be partially shielded in buildings, near steep cliffs, or in heavy forests. Some underground measurements revealed that cosmic-ray effects diminish substantially at a depth of 30 ft., and virtually disappeared at 100 to 150 ft. To illustrate the effect of cosmic rays, the following background counts indicated by one type of instrument are cited:

Observation Point	Count per Minute
Over overburden near Princeton, N. J.	50 to 52
In a five-story building, same location	10 to 20
Over barren granite and granodiorite at LaBine Point, N. W. T.	80 to 90
Over overburden in the same area	60 to 65
Over granite and granodiorite at Contact Lake, 9 miles southeast of LaBine Point	80 to 90
Over porphyry at the same location	60
Over overburden covering porphyry or diorite at the last-named property	60 to 65

G. C. Ridland, who reported these observations,[3] cautions that a background count for a particular counter tube is characteristic of that tube only, and that if a new tube is used in a survey, a new background count should be established.

In the Contact Lake surveys, a tube was used which was designed by Dr. G. L. Locher to detect weak gamma radiation from a pitchblende source, but sufficiently insensitive to cosmic radiation to prevent a background count which would obscure the gamma-ray count. Counts for periods of 10 to 12 minutes were taken at each point to obtain a reliable average. Some

[3]"Use of the Geiger-Mueller Counter in the Search for Pitchblende-bearing Veins at Great Bear Lake, Canada." G. C. Ridland, A.I.M.E., T.P. 1614.

Geiger tube, completely inclosed, with thin mica window to admit radiation. Courtesy Cyclotron Specialties Co.

tube manufacturers recommend counts of 15- to 30-minute duration.

With the foregoing fundamentals as a background, let's see how Geiger-Mueller equipment can be used in the mining industry. The following examples include actual applications, and others which have been tried or suggested by geophysicists, geologists, and engineers in mining and related fields.

Exploration for Pitchblende-Bearing Veins. During a geologic investigation of silver-bearing veins occasionally identified with pitchblende at Contact Lake, N.W.T., Canada, a counter tube was used to determine gamma-ray emissions from rocks in the vicinity of mine workings.

The equipment was first tested over actual radioactive veins at LaBine Point, 9 miles northeast of the Contact Lake area. See accompanying gamma-ray profile over pitchblende orebodies. In other preliminary tests at Princeton, N. J., 50 lb. of pitchblende was detected 20 ft. away from the detector by averaging 12 one-minute gamma-ray counts. Gamma rays from 50 lb. of radioactive material were also detected through 5½ ft. of soft overburden.

Results of gamma-ray surveys over nine shear zones at Contact Lake were as follows: Four gave negative results; two showed definite anomalies; and three reacted favorably enough to warrant definite exploration programs. Because of marked differences in background counts over a diorite and a porphyry, contacts could be traced easily with counter equipment. The following precautions which were observed during the surveys, should ordinarily be observed in similar surveys:

1. When electric storms appeared on the horizon, the survey was discontinued because electrical storms can discharge the Geiger tubes.

2. Operators avoided contaminating clothes, particularly boots, with radioactive dust.

3. No radioactive dust was allowed to settle in the counting equipment case.

4. The equipment was kept dry to avoid shorts in the high-voltage circuit.

5. The instrument was not taken underground where radioactive minerals were mined, nor in mills treating such minerals.

Portable Geiger-Mueller counters were also used for prospecting by Eldorado Mining & Refining (1944), Ltd. Richard Murphy, director of exploration, reports that the equipment performed satisfactorily in wet and dry weather and in temperatures ranging from 20 to 90 deg. F. The prospector's counter weighs about seven pounds. About 80% of the instruments remained serviceable throughout field periods of four to six months.

Major differences in normal radioactivity of various bodies of rock were observed, and exposed veins containing relatively insig-

nificant amounts of uranium increased the counting rate unmistakably.

In prospecting, the equipment was worn on a shoulder sling with counter tube at waist level, while the operator moved at a slow walk. Under these conditions, a 100% increase in background count was necessary to detect a narrow anomaly (as over a vein.) The operator had to pass within a few feet of an anomaly to observe a signal. If radioactivity was intense, this range increased, but no anomaly was observed at a greater distance than 30 ft. Overburden absorbed radiation. Consequently no vein deeper than three feet below the surface was discovered with the counter.

Radioactivity Well Logging. In a review of radioactivity well logging[1] Jackson and Campbell described some applications which should be useful in mining as well as oil work. The equipment used to measure gamma-ray intensity consisted of an ionization chamber three feet long containing two electrodes, and filled with a rare gas under pressure. The intensity of the current that passed through the electrodes was proportional to the ionization caused by gamma radiation. This current was amplified and recorded as the tube was lowered down a well.

As shales are generally more radioactive than limestones and sandstones, this equipment differentiated nicely between the first and last two. But both sandstone and limestone recorded low values. Hence to differentiate further, the operators devised an ingenious neutron gun, properly shielded from the ionization chamber, which bombarded the rocks being scanned with neutrons. These atomic particles produced temporary additional radiation which varied with the hydrogen content in the rocks. Water and hydrocarbon liquids and gases (in porous section) gave low reading on the neutron curve which was logged in the same manner as the gamma-ray curve. Thus a minimum value of the gamma-ray curve could be either a limestone or a sandstone, but a minimum value on the neutron curve for the corresponding section of the well would indicate a sandstone and a high value would indicate a limestone. The foregoing methods might be useful in exploring bedded potash deposits.

Geiger tubes in Diamond Drill Holes. Some Geiger counters are made small enough to fit in diamond-drill rods. This suggests the following applications, especially for holes where cores and records have been lost or discarded:

1. To locate veins containing uranium, radium, or other radioactive minerals.

2. To determine extensions of faults and fissures. Some operators are planning to introduce tracers in exposed faults and fissures and locate extensions of them by scanning diamond-drill holes and other mine exposures for the presence of the migrating tracers.

3. To aid in the search for certain mineral deposits which emit radon or produce radioactive solutions. Geophysicists have pointed

(*Continued on page* 123)

[1] "Some Practical Aspects of Radioactivity Well Logging." W. J. Jackson and J. L. P. Campbell. A.I.M.E.T.P. 1923.

Problems in Cell Design For Electrolytic Chromium

R. R. Lloyd, Chemical Engineer, U. S. Bureau of Mines, Boulder City, Nev.

A PROCESS for the electrowinning of chromium, applicable to low-grade domestic ores, is being developed in laboratories of the U. S. Bureau of Mines at Boulder City, Nev. A pilot plant producing 50 lb. per day of chromium metal was built in 1944 and is now producing about 70 lb. daily. Every effort is being made in this plant to use commercial types of equipment and construction materials, and the cathodes used are of commercial size.

Success of the chromium process, and of the electrolytic manganese process also worked out at Boulder City, depends in part upon proper design of the diaphragm cells that must be used. The most interesting elements of that design are discussed here. A flowsheet for the chromium electrowinning process and a discussion of the chemical problems involved have already been published.[1]

In the pilot plant, minus-28-mesh lowgrade chromite concentrates are wet-ground to minus-270 mesh, then dried and stored. Batches of 500 lb. are removed and pressure-digested at 130 to 160 deg. C. with spent anolyte from the electrolytic cell and some new sulphuric acid, which forms a 45% sulphuric acid solution containing 3.5 to 4% chromic acid. Under the pressure and temperature supplied by the exothermic reaction, nearly all the metallic constituents of the ore dissolve, leaving normal metal sulphates and practically no free sulphuric acid. The raw digest liquor is diluted with spent mother liquor to produce a solution containing about 42 grams of chromium and 150 grams of ammonium sulphate per liter, appreciable quantities of iron, aluminum, magnesium, and sodium, and small quantities of several other metals.

The solution is filtered at 65 deg. C. to remove siliceous gangue and "stabilized" by heating to 80 deg. C. for one hour. The stabilized

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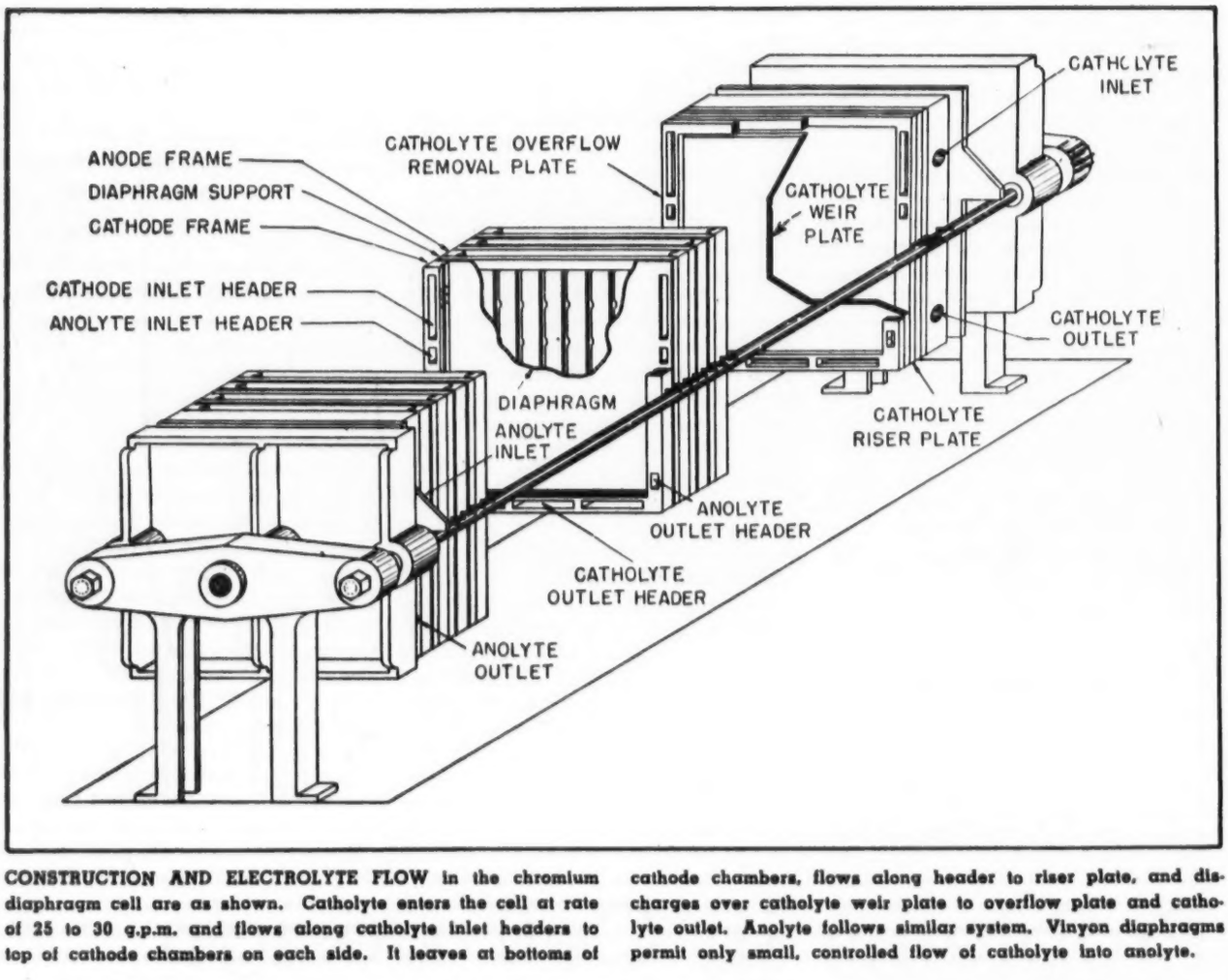
[1] R. R. Lloyd, W. T. Rawles, and R. G. Feeney. The Electrowinning of Chromium From Trivalent Salt Solution. Trans. Electrochem. Soc., Vol. 89, 1946, pp. 443-454.



CONSTRUCTION AND ELECTROLYTE FLOW in the chromium diaphragm cell are as shown. Catholyte enters the cell at rate of 25 to 30 g.p.m. and flows along catholyte inlet headers to top of cathode chambers on each side. It leaves at bottoms of cathode chambers, flows along header to riser plate, and discharges over catholyte weir plate to overflow plate and catholyte outlet. Anolyte follows similar system. Vinyon diaphragms permit only small, controlled flow of catholyte into anolyte.

liquor is sent immediately to a vacuum crystallizer, where all of the aluminum and most of the iron and magnesium are removed at 4 deg. C. These ammonium sulphate complex crystals contain most of the leached impurities. Chromium remains in solution because of the stabilizing treatment. These "impurity" crystals are removed in rubber-lined basket centrifuges, and the purified mother liquor is clarified in a wooden filter press and sent to aging.

Aging takes place in a 5,000-gal. Koroseal-lined thickener at 30 deg. C. Chromium reverts from the green to the violet modification and crystallizes as chromium ammonium alum, containing some ferric iron and small quantities of many other impurities. The chrome alum is removed by centrifuging; and the spent mother liquor, containing about 22 grams chromium per liter, is returned to the circuit.

One more crystallization of the chrome alum in a 2,000-gal. thickener at 30 deg. C., using spent catholyte from the cells as recrystallizing liquor, reduces iron and other impurities below the critical concentrations. The iron in the crude alum is reduced to the ferrous state by the divalent chromium in the spent catholyte and does not recrystallize with the chromium. The pure chrome alum is mixed with glaubers salts, recovered from the impurity alums, and dissolved to produce cell feed containing 85 grams of chromium, 115 grams of ammonium sulphate, and 60 grams of sodium sulphate per liter.

Continuous Cell Feed

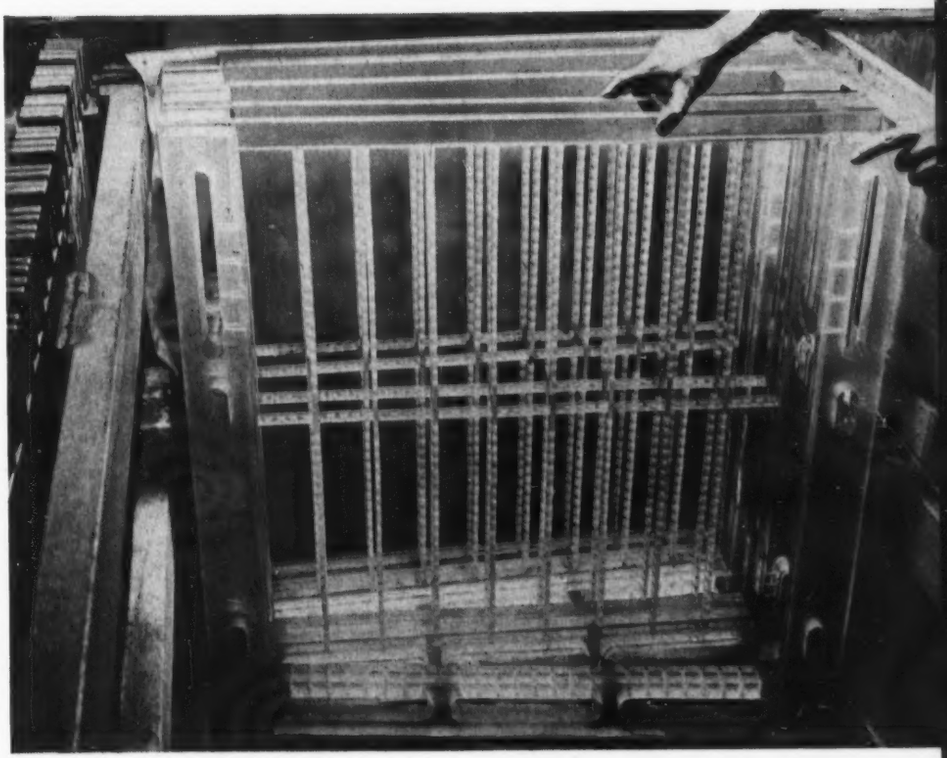
The cell feed is added continuously to the cathode compartments of the pilot cell; and spent catholyte, containing 10 grams of trivalent chromium and 20 grams of divalent chromium per liter, is removed continuously and returned to the alum-recrystallization circuit. About 60% of the spent catholyte passes through the diaphragms into the anode compartment, where the chromium is oxidized to chromic acid. Thus, two spent solutions, one strongly oxidizing and one strongly reducing, are removed from the cell room and reused in the circuit. The present pilot cell contains 5 brass or stainless-steel cathodes, each with 10 sq. ft. of submerged surface, and 10 lead-silver anodes. The cathode current density is normally 65 amp. per square foot, and normal production is 1.3 lb. of chromium per day per square foot of cathode area. Cathodes, carrying 26 lb. of metal, are removed at 48-hour intervals for stripping. Cell voltage is 4.2 to 4.5 volts.

Diaphragms are necessary in the electrolytic chromium cell not only to prevent the acid forming at the anode from mixing with the catholyte but also to prevent the chromic acid formed at the anode from oxidizing the divalent chromium formed at the cathode.

The problem of catholyte and anolyte intermixing is further increased by the high acid concentration of the anolyte, which varies from 250 to 300 grams per liter. The catholyte pH is kept between

1.8 and 2.2, which is the equilibrium pH of chromium alum at the operating temperature of 40 to 46 deg. C. and does not represent free sulphuric acid.

Almost entirely impervious diaphragms were used for development work, but these were modified later to permit some flow of catholyte into the anolyte to provide chromium for chromic acid formation in the anolyte and to decrease the voltage drop across the diaphragms. The addition of catholyte, containing sodium and ammonium salts, to the anolyte also helped to control the catholyte pH. The permissible flow of catholyte through the diaphragms is only 1.6 gal. per square foot per day, so that a relatively impervious diaphragm is essential. The diaphragm must also be resistant to sulphuric and chromic acids and should have a low and uniform electrical resistance.



PILOT-PLANT CHROMIUM CELL has Lucite frames drilled for solution flow. Anode frames hold diaphragm supports made of ¼-in. Plexiglas. Catholyte, because of its high level and high sp.g., holds diaphragms against supports, which rest against anodes. Each diaphragm (four diaphragms have been removed for the photographs) is a single sheet of fabric held in place by pressure of alternate anode and cathode frames.

Problem of Control

In addition to the usual problems of diaphragms, some unusual ones arise in the chromium process. Transference rate of hydrogen ion (acid) toward the cathode is much greater than the transference rate of sulphate ion toward the anode. Unless controlled, this disparity results in a drop in pH of the catholyte and re-solution of the metal. Three general control methods are: (1) Plating of some hydrogen on the cathode in place of metal, with a resulting loss in plating current efficiency; (2) increasing the total sulphate ion in the catholyte; and (3) using an anolyte containing sodium and ammonium ions which transfer through the diaphragm in place of some hydrogen ions.

In practice, every effort is made to maintain high plating efficiency, and the sulphate concentration of the catholyte cannot be changed readily. Consequently, method (3) must be used for day-to-day control. The sodium and ammonium concentrations in the anolyte are controlled by regulating the quantity of catholyte flowing into the anolyte. Short period variations in the hydrogen-ion concentration are prevented by the strong buffering action of the catholyte.

Another problem arises from the great difference in electrical conductivity between the anolyte and catholyte, which makes it necessary to maintain the diaphragms equidistant from the cathode at all points. A curved diaphragm has the same effect as a curved anode would have in a cell without a diaphragm.

For good operating efficiency the catholyte should flow past the cathode surface fairly rapidly and without undue exposure of the catholyte to the atmosphere or any great variation of the liquid level in the catholyte chambers. The anolyte must be circulated slowly to prevent stratification, and the level must be held at a point below the catholyte level. The specific gravity of the catholyte and anolyte must be controlled with respect to each other.

Features of a cell designed to serve all of these functions are illustrated in the isometric drawing. After leaving the cell, the catholyte flows to a holding tank with a calibrated volume, where it is cooled by pumping through a concentric-tube Karbate heat exchanger and returns to the cell through a flow meter. All measurements, additions, and controls are made at the holding tank, and no inspection of the cell is necessary. Anolyte flows through a similar system at a much lower rate and is not cooled.

Aeration of the catholyte at the surface of the cathode chambers is prevented by the hydrogen foam which forms on the surface, and it is kept to a minimum in the holding tank by baffles set to produce a quiescent liquid surface. If aeration occurs, the divalent chromium is oxidized to the trivalent state, and current efficiency drops.

Vinyon and Fiberglas cloth were the only diaphragm fabrics tested that had sufficient acid-resistance, together with a low electrical resistance. Neither of these materials was sufficiently impervious to solution flow, but the desired porosity was obtained by controlled treatment with natural-rubber latex or an emulsion of an acrylic resin. Vinyon cloth treated with an acrylic resin was used for most of the pilot-plant work. However, a successful four-month campaign was recently completed, using untreated Vinyon cloth which had been preshrunk to a measured porosity. Although the first cost of the coated or preshrunk Vinyon is high, the diaphragms have a long life and do not become coated with calcium sulphate as they do in a manganese cell. If a hole develops in a diaphragm, the cell can be shut down and broken apart, a new or patched diaphragm sheet installed, and the cell returned to the system in a few hours.

MARKETS—Trends and Prices

Copper Price Returns to 21½c. Valley Basis — Lead Firm — Foreign Silver Breaks Sharply

AS THE FIRST HALF OF 1947 ended it became apparent to most sellers of major non-ferrous metals that a distinct change has come over the general complexion of the market. The scramble for copper, lead, and zinc that carried over from last year finally moderated, with consumers showing nervousness over the price trend. In numerous instances consumers reverted back to the old practice of placing new business against actual requirements. Filling of pipelines, with a few exceptions, has been completed, and, unless a fresh wave of work stoppages should occur, the supply situation was viewed as greatly improved.

Price changes were fairly numerous in June, with the trend in most cases toward a lower level. Our index of non-ferrous metal prices moved downward for the first time since August 1946. The index for June was 150.05, against 154.03 in May. Lower averages for copper and silver were largely responsible for the decline. Lead prices remained firm. Zinc was steady in the domestic market, but unsettled abroad. Platinum declined in a dull market. Cobalt and selenium advanced.

Confusion over copper prices that upset business during May ended early in June as it became evident that the 24c. Valley quotation for foreign copper could not be maintained. Offerings of foreign metal increased, bringing lower prices, and the scrap situation developed further weakness, adding to the selling pressure. By June 12, quotations for copper in both foreign and domestic markets dropped back to the basis of 21½c. per pound. Domestic consumers purchased fair tonnages throughout the month, but inquiry centered largely in July and August metal. In reference to last quarter business, most observers declined to take a definite stand on prices. The unsettled state of copper scrap was viewed as a disturbing factor.

Foreign buying was not up to the level attained earlier in the year. This condition was brought about largely because of the growing world-wide shortage in dollar exchange. Demand for copper outside of the United States appeared to be just as urgent as formerly, and buying is expected to return in volume as soon as credits can be arranged.

The United States copper statistics for May showed total deliveries of 122,868 tons, against 120,311 tons (corrected) in April. Of the total quantity of copper delivered during May, the Office of Metals Reserve supplied consumers with 11,195 tons. Domestic refineries produced 110,670 tons of copper in May, against 107,270 tons in the preceding month.

Fabricators placed consumption of copper in May at 118,050 tons, against 121,391 tons in April. Stocks of refined copper in the hands of the fabricating division of the industry as May ended totaled 408,872 tons, against 377,072 tons a year ago.

Lead experienced a continuation of the heavy demands that featured the market earlier in the year, but consumers lost all fear of another uplift in prices. Some small consumers purchased less metal than in prior months, but this was offset by continued liberal buying on the part of makers of pigments and tetraethyl.

Imports of lead have been larger than anticipated, with the result that total monthly deliveries of refined lead have been averaging between 60,000 and 65,000 tons a month.

In a talk on the lead outlook before a group of purchasing agents, Irwin H. Cornell, vice-president and sales manager of St. Joseph Lead Co., said that he looks for the price of lead to remain unchanged at 15c., New York, over the third quarter, unless a drastic cut in the use of the metal takes place in that period. In the fourth quarter, he believes, it is quite possible that the lead price will go down. In reference to 1948, he thought the average price will be nearer 12c. than 15c. per pound. Prevailing prices will increase production and curtail consumption to such an extent that there will, in time, be an oversupply of lead. Supply of lead in the first half of 1947 was estimated at 600,000 tons. This supply consists of imported lead in ore and pigs, domestic mine production, secondary lead production from scrap, and metal absorbed from stocks.

Zinc buying diminished, but the price ruled steady in the domestic market. Uncertainty over the future of the Premium Price Plan hung over producers and costs might rise again because of fresh demands for higher wages. On the other hand, there were signs that competition for foreign business is returning. Prices paid outside of the United States have been easier. Prime Western zinc, East St. Louis, continued at 10½c. On export business, Prime Western sold down to 10c., Gulf ports. The British Ministry of Supply purchased 15,000 tons of Latin American zinc for shipment over the second half of the year, ex Gulf ports. This was purchased at a fixed differential below the monthly average

Zinc Production by Countries

(American Bureau of Metal Statistics)

In this summary the production of slab zinc is computed on the basis of the country's metallurgical works, regardless of origin of the ore that is beneficiated. Figures in tons.

	Jan.-Dec. 1946	Jan. 1947	Feb. 1947	March 1947	April 1947
United States (a)	773,307	73,683	66,300	76,700	75,200
Canada (b)	185,692	14,199	13,335	13,969	15,076
Mexico	53,311	4,701	4,258	4,658	4,439
Belgium	89,231	10,520	9,292	10,475	10,914
France	32,764	4,049	3,812	4,242	4,433
Great Britain	73,199	6,945	6,257	6,367	....
Italy	17,202	1,337	1,174	2,208	2,909
Norway (b)	34,204	3,308	2,371	2,239	2,420
Spain	19,042	1,802	1,667	1,835	1,789
Australia (b)	86,190	6,815	5,694	6,425	....
Rhodesia (b)	19,224	2,048	1,848	2,033	1,854
Totals (c)	1,383,366	129,407	116,008	131,151	....

(a) Partially electrolytic. (b) Entirely electrolytic. (c) The accounting omits production in Germany, Poland, and Russia, and the small productions of Czechoslovakia and South America.

MARKETS—Trends and Prices

of prices obtaining in East St. Louis market.

Tin supplies remain inadequate and normal conditions are not likely to prevail in this metal until late in 1948, owing to the slow recovery in production in the Far East. Extension of tin control for the United States will be continued, and authority to operate the smelter at Texas City for two years has been approved by Congress.

Silver of foreign origin broke sharply because of inability to sell freely abroad, particularly to India, and a reduced volume of sales to domestic consumers. Early in June the New York Official quotation was maintained at 70⅜c. an ounce troy. An accumulation in supplies caused the price to weaken, with a break to 59⅜c. on June 20, the lowest price named here since Sept. 21, 1945. Before the end of June, the price steadied on receipt of news here that Mexico had arranged to purchase 2,000,000 oz. of silver from current production in that country for coinage purposes. In the event of another weak spell, it was thought likely that Mexico would again enter the market for silver. The Treasury continues to purchase newly mined domestic silver on the basis of 90.5c. an ounce.

Platinum suffered partly because of the unsettled state of business in the jewelry trade. The price was reduced $5, the market settling at $53 an ounce on wholesale business and at $56 on sales to consumers. Iridium was more or less nominal at a spread of $10 an ounce in quotations. Palladium was unchanged at $24.

Quicksilver was quiet. In the absence of selling pressure from abroad the price situation here underwent no further deterioration. In fact, several sellers refused to offer metal at the lowest price named in the local trade.

Tungsten was purchased outside of the United States at higher prices, which forced quotations in this market up to $30 and $33 per unit of WO_3, duty included. Foreign buyers paid from $23 to $25 per unit.

An event of importance to Canadian producers was the announcement that effective on June 10 price control in Canada's home market officially ended for copper, lead, and zinc. Controls were retained for tin and antimony.

Major Metals

U. S. DAILY AND AVERAGE PRICES

1947 June	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
2	21.800	23.000	80.000	15.000	14.800	10.500
3	21.600	22.925	80.000	15.000	14.800	10.500
4	21.625	22.825	80.000	15.000	14.800	10.500
5	21.400	21.925	80.000	15.000	14.800	10.500
6	21.300	21.675	80.000	15.000	14.800	10.500
7	No Market	21.425	80.000	15.000	14.800	10.500
9	21.425	21.425	80.000	15.000	14.800	10.500
10	21.725	21.625	80.000	15.000	14.800	10.500
11	21.475	21.425	80.000	15.000	14.800	10.500
12	21.225	21.425	80.000	15.000	14.800	10.500
13	21.225	21.425	80.000	15.000	14.800	10.500
14	No Market	21.425	80.000	15.000	14.800	10.500
16	21.225	21.425	80.000	15.000	14.800	10.500
17	21.225	21.425	80.000	15.000	14.800	10.500
18	21.225	21.425	80.000	15.000	14.800	10.500
19	21.225	21.425	80.000	15.000	14.800	10.500
20	21.225	21.425	80.000	15.000	14.800	10.500
21	No Market	21.425	80.000	15.000	14.800	10.500
23	21.250	21.425	80.000	15.000	14.800	10.500
24	21.225	21.425	80.000	15.000	14.800	10.500
25	21.225	21.425	80.000	15.000	14.800	10.500
26	21.225	21.425	80.000	15.000	14.800	10.500
27	21.225	21.425	80.000	15.000	14.800	10.500
28	No Market	21.425	80.000	15.000	14.800	10.500
30	21.225	21.425	80.000	15.000	14.800	10.500
AVERAGES FOR MONTH						
June	21.348	21.642	80.000	15.000	14.800	10.500
AVERAGES FOR WEEK						
June						
4	21.706	22.913	80.000	15.000	14.800	10.500
11	21.465	21.583	80.000	15.000	14.800	10.500
18	21.225	21.425	80.000	15.000	14.800	10.500
25	21.230	21.425	80.000	15.000	14.800	10.500
CALENDAR WEEK AVERAGES						
June						
7	21.545	22.296	80.000	15.000	14.800	10.500
14	21.415	21.458	80.000	15.000	14.800	10.500
21	21.225	21.425	80.000	15.000	14.800	10.500
28	21.230	21.425	80.000	15.000	14.800	10.500

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. **All prices are in cents per pound.**

(*a*) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.275c. per pound, the average differential for freight and delivery charges.

(*b*) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade in most instances is 1¼c.

Quotations for lead are for common lead.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1947 June	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
2	402.500	70.750	43d.	172s. 3d.	$35.00
3	402.500	70.750	43d.	172s. 3d.	35.00
4	402.500	70.750	43d.	172s. 3d.	35.00
5	402.500	70.750	43d.	172s. 3d.	35.00
6	402.500	70.750	43d.	172s. 3d.	35.00
7	(c)	(c)	(c)	(c)	35.00
9	402.500	70.750	43d.	172s. 3d.	35.00
10	402.500	70.750	43d.	172s. 3d.	35.00
11	402.500	70.750	43d.	172s. 3d.	35.00
12	402.500	70.750	43d.	172s. 3d.	35.00
13	402.500	70.750	43d.	172s. 3d.	35.00
14	(c)	(c)	(c)	(c)	35.00
16	402.500	69.750	43d.	172s. 3d.	35.00
17	402.500	68.375	43d.	172s. 3d.	35.00
18	402.500	68.375	42d.	172s. 3d.	35.00
19	402.500	64.750	42d.	172s. 3d.	35.00
20	402.500	59.750	39d.	172s. 3d.	35.00
21	(c)	(c)	(c)	(c)	35.00
23	402.500	59.750	39d.	172s. 3d.	35.00
24	402.500	59.750	39d.	172s. 3d.	35.00
25	402.500	59.750	38d.	172s. 3d.	35.00
26	402.500	60.750	37d.	172s. 3d.	35.00
27	402.500	61.750	37¼d.	172s. 3d.	35.00
28	(c)	(c)	(c)	(c)	35.00
30	402.500	62.750	38d.	172s. 3d.	35.00
AVERAGES FOR MONTH					
June	402.500	66.810	41.298	—	35.00
AVERAGES FOR WEEK					
June					
4	402.500	70.750	—	—	—
11	402.500	70.750	—	—	—
18	402.500	69.600	—	—	—
25	402.500	60.750	—	—	—

Calendar week averages, New York Silver: June 7th, 70.750; 14th, 70.750; 21st, 66.200; 28th, 60.350.

(c) No market (Saturday)

(*c*) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions, and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver **90.5c. per troy ounce 1000 fine, effective July 1,** 1946. London silver in pence per troy ounce, basis .999 fine.

(*d*) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS—Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for May and June:

	May	June
Quicksilver, N. Y. flask	84.462	84.000
Antimony (a)	35.940	35.940
Antimony, bulk, Laredo	33.000	33.000
Antimony, in cases, Laredo	33.500	33.500
Antimony, Chinese (b)	.....	.....
Platinum, oz. troy	59.269	55.640
Cadmium (c)	175.000	175.000
Cadmium (d)	177.500	177.500
Cadmium (e)	180.000	180.000
Aluminum ingot	15.000	15.000
Magnesium	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

100 is composite for 1922-3-4. (Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1937	90.86	1942	86.80
1938	73.67	1943	88.74
1939	77.71	1944	88.74
1940	79.22	1945	90.86
1941	83.49	1946	110.057

	1945	1946	1947
January	88.74	96.42	140.88
February	88.74	96.42	140.42
March	88.74	96.42	150.71
April	88.74	96.42	153.14
May	88.74	96.42	154.03
June	88.74	107.16	150.05
July	88.74	117.11	.....
August	88.74	113.32	.....
September	91.16	113.32	.....
October	96.40	114.25	.....
November	96.42	131.23	.....
December	96.42	142.19	.....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major non-ferrous metals. Prevailing delivered prices for consumers in the United Kingdom follow:

	Per Long Ton		
COPPER:	£	s.	d.
Electrolytic, high conductivity	137	0	0
Fire refined, high conductivity	137	0	0
Fire refined, high grade	136	10	0
Fire refined, min. 99.2 percent	135	10	0
Fire refined, min. 99.7	136	0	0
Hot rolled black wire rods	132	0	0
LEAD:			
Soft, foreign, duty paid	90	0	0
Soft, Empire	90	0	0
English refined	91	10	0
ZINC:			
Foreign (G.o.b.), duty paid	70	0	0
Domestic (G.o.b.)	70	0	0
Prime Western and debased	70	0	0
Refined and electrolytic	70	15	0
Minimum 99.99 percent	72	5	0
TIN:			
Ingot, 99 percent	437	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(June 30, 1947)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	35.940
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$1.75
Calcium, lb. ton lots, 97 @ 98 percent, cast	$1.85
Chromium, 97 percent grade, lb.	89c.
Cobalt, 97 to 99 percent, per lb.	$1.65
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 percent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$53.00
Quicksilver, flask of 76 lb., 25 flasks or more	$84.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$20.00
Titanium, 96 to 98 percent, lb.	$8.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$14.00@$16.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal)	$37.00@$38.00
48% Cr_2O_3, 3 to 1 ratio	$39.00@$40.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$5.95
Mesabi bessemer	$5.70
Old Range non-bessemer	$5.80
Mesabi, non-bessemer	$5.55
Lead (Galena) 80 percent, Joplin, Mo., ton	$195.65
Manganese Ore—Per long ton unit of Mn, basis 48 percent manganese, subject to premiums and penalties, f.o.b. cars Atlantic and Gulf ports, duty paid, 64@66c.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid	$30.00@$33.00
Domestic, scheelite, 60 percent and upward	$30.00@$31.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	6c.
Cobalt Oxide, 70 to 71 percent, lb.	$1.27½
Copper Sulphate, 100 lb.	$7.60

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent, per lb. of Cr contained	15.60c.
Ferromanganese, 78 to 82 percent, gross ton	$135.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	7.45c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 percent C, per lb., contracts	6.45c.

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$56.00@$63.00
Shorts	$19.00@$30.00
Vermont, f.o.b. Hyde Park:	
Shingle stock	$82.50@$91.50
Paper stock	$58.00@$65.00
Waste	$43.00
Refuse or shorts	$20.50@$38.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.75@$9.40
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.00@$5.00
Domestic, chemical, 55 to 58 percent	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 70 percent, all rail movement, ton	$33.00
Acid 98 and 1 percent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica: Domestic producers quote on punch and sheet as follows: Punch, 22c. per pound; 1½x2 inch, $1.10; 2x2 inch, $1.60; 2x3 inch, $2.10; 3x3 inch, $2.75; 3x4 inch, $3.50; 3x5 inch, $4; 4x6 inch, $5. Wet ground, very fine, $90 per ton. Special grades command premium. Bulk sales dry ground, $32.50 per ton. Scrap, $28 per ton and up.	
Ocher, Georgia, ton	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$18.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$33.00
Steel, base price, Pittsburgh Billets, gross ton	$42.00
Structural shapes, 100 lb.	$2.65

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Russell Bill Stalled On Floor of House

The Russell Bill (H.R. 2455) providing for continuation of the Premium Price Plan for copper, lead, and zinc and other minerals for five years, was pigeonholed in the House on June 30. A new bill, continuing the plan for two years, has been introduced by Rep. Allen, of Illinois.

Although the Russell bill had been given a rule for House Consideration in May, the Republican chiefs still had not given it a place on the calendar by late June. Lack of complete backing by industry, and the press of more important "political" legislation, were evidently responsible for the political brush-off.

If the new bill eventually passes both houses of Congress, it will be considerably after the date on which the Premium Price Plan expired.

Senate Restores Part of Interior Budget Cuts

The Senate last month modified somewhat the House cuts in the budget appropriations for the Geological Survey and the Bureau of Mines, but the new figures were still a long way from what the two agencies had thought necessary to carry on their programs.

Although the Senate restored $1,143,110 to the Survey appropriation, the total was still $7,848,560 short of the original budget estimates. Items given increases included geologic surveys, from the House approved $1,690,000 to $2,374,500; gaging streams, from $2,578,680 to $2,625,000; classification of lands, from $139,000 to $245,000; printing and binding, from $389,000 to $479,500; and minerals on public lands and naval petroleum reserves, from $434,210 to $650,000.

The Bureau of Mines budget fared proportionately better at the hands of the Senate, receiving $1,892,975 more than the House approved. This, however, was still $4,407,150 short of the budget estimates for next year. Items which were increased over House figures were: testing fuel, from $302,285 to $416,500; mineral mining investigations, from $360,090 to $440,300; investigation and development of domestic mineral deposits, from $800,000 to $1,120,000; coal investigations, from $57,000 to $100,000; oil and gas investigations, from $579,000 to $634,550; mining experiment stations, from $1,000,000 to $1,120,000; metallurgical research and pilot plants, from $600,000 to $1,120,000; and economics of mineral industries, from $555,000 to $755,000. One item of $450,000, for construction of an anthracite research laboratory, was added to the bill by the Senate. Another, covering care of buildings and grounds at Pittsburgh, Pa., was cut $10,000.

A conference will decide how much of the Senate increases in the budget will be allowed in the final draft.

Court Decides Against Titanium Producers

A year-and-a-half old district court decree dissolving the alleged interlocking patent and cartel arrangements on production of titanium pigment between National Lead and its subsidiaries and duPont has been sustained by the Supreme Court.

Back in October 1945, the district court of the southern district of New York ordered the two firms to void a long series of agreements between themselves and foreign titanium producers, to divest themselves of holdings of foreign titanium firms or else to acquire complete ownership of them, and to offer non-exclusive licenses under their titanium patents to all comers at a "reasonable" royalty.

This last was the point at issue in the Supreme Court. The Government had asked that the district court decree be changed to require offer of free licenses instead of licenses at a reasonable royalty. It was supported in this plea by National Lead but opposed by duPont. The high court refused to make the change, ruling that although a free license requirement might be legal in some cases, it was satisfied in the present case with the judgment of the district court that offer of licenses at a reasonable royalty was the appropriate device to prevent any further violations of the anti-trust laws.

Support Needed for More Percentage Depletion

Domestic producers of flake graphite, beryl, feldspar, lepidolite, spodumene and other strategic minerals, who want to be heard on the need for percentage depletion allowances and the effects of duty cuts on their business, have been urged to file briefs with the House Ways and Means Committee as soon as possible.

Rep. Bertrand W. Gearhart (R.-Calif.), whose bill (H.R. 3624) would re-enact the 15% depletion allowance provided in the 1942 and 1943 revenue acts for 14 and possibly 15 non-metallic minerals, stated that hearings on his bill before the House Committee June 4 had brought forth statements from producers of only nine minerals. Apparent lack of interest on the part of all but a few minerals producers might cause the House to cut some of the minerals from the provisions of the bill, he said. Most of these minerals had wartime allowances, which have expired, but a few new ones were added.

If there is sufficient interest displayed by the minerals industry, another hearing on the Gearhart bill may be held, at which time the subject of import excise taxes might be considered as a means of protection for domestic producers, the Congressman said, adding that the hearing would also show what minerals need help and protection.

Treasury Would Tax Exploration Premiums

Special premiums provided to encourage exploration and development under the Premium Price Plan for copper, lead and zinc will be regarded as gross income in relation to income tax, the Treasury Department has advised Senator McFarland of Arizona.

Although OES directive 137 states that "exploration premiums will not be considered as income to the operator nor treated as such in any of the records of the Quota Committee," the Treasury Department opinion states that "it is clear that the income referred to in this order is the income to be used by the Quota Committee in calculating the operator's profit margin before premiums to test the applicant's need for price support." The opinion also points out that the premium plan is provided for in an appropriation measure and not in a revenue one and that the OES directive, therefore, does not grant taxpayers any right not otherwise provided in the revenue code.

If these special premiums are used by the operator to finance current development which does not result in the development of new ore deposits, the Bureau of Internal Revenue will consider the expenditures a proper charge under current expense, the Treasury stated.

In any case where the exploration and development results in the opening up of new deposits, however, Internal Revenue would hold that the excess of expenditures over receipts from the project should be charged to capital account to be recovered through the depletion allowance over the productive life of the new deposit.

(*Continued on next page*)

Additional Suspension of Assessment Work Approved

Congress has approved and sent to the President a bill to suspend annual assessment work on mining claims in Alaska for one year. The House bill was amended in the Senate to include the entire United States. A conference committee rejected the Senate amendment.

The bill provides that assessment work be suspended until noon, July 1, 1948, "provided that every claimant of any such mining claim, in order to obtain the benefits of the act, shall file in the office where the location notice or certificate is recorded, on or before noon, July 1, 1948, a notice of his desire to hold said mining claim under this act."

Labor Reform Act Enacted Despite Veto

The Taft-Hartley Labor Act, vetoed by the President but reconstituted by a Congressional override, contains 15 important changes from labor law, as it was previously known.

1. "National emergency" strikes, endangering public health or safety, may be enjoined for a period of 80 days, during which time a board of inquiry investigates the facts and employees are polled on acceptance of the employer's last offer for settlement. This waives the Norris-LaGuardia anti-injunction act.

2. The Conciliation Service's functions are removed from the Labor Department and vested in a new agency, the Federal Mediation and Conciliation Service.

3. Unions may be sued for breach of contract and for damages inflicted in jurisdictional strikes and boycotts.

4. The closed shop is outlawed. Any employer allowing a closed shop is subject to charges by the National Labor Relations Board on complaint of a non-union job applicant.

5. The union shop and other compulsory union membership devices are permitted only if a majority of all employees eligible favor them in a secret ballot. State laws which forbid these devices supersede the new federal law.

6. Jurisdictional strikes and secondary boycotts are outlawed and the NLRB is under mandate to enjoin them. The Norris-LaGuardia Act does not apply here.

7. Unfair labor practices—by unions—are outlined and outlawed. These include refusal to bargain, employee coercion, excessive fees, "featherbedding," and coercion of employers into industry-wide bargaining.

8. Foremen's unions are denied the rights of Government protection under the law. Plant guards may have NLRB assistance in bargaining through unions which are separate from those of regular employees.

9. Professional and craft workers may bargain through their own union representatives, if a majority favor it, even though they have been in a plant where the workers all bargained through a plant-wide organization.

10. Federal employees who strike must be discharged.

11. All officers of a union must swear they are not communists or communist sympathizers before the organization can be certified or enjoy NLRB assistance.

12. Employer-participating welfare funds may be set up only if the employer has an equal voice with the union in their administration.

13. Neither unions nor companies are allowed to make expenditures for Federal political campaigns. Previous laws which prohibit them from making political contributions continue in effect.

14. Five additional types of elections are included in new procedures for the NLRB. The rules also outline handling of complaints, decisions on jurisdictional strikes, and court proceedings. Unions are obligated to file detailed financial and organizational statements with the labor department.

15. The NLRB is enlarged by two more members, bringing the Board to a total of five. The review division of the Board is abolished. The general counsel is given full power to decide what cases are taken up, and is in charge of all field work.

Texas Tin Smelter To Be Continued

A resolution continuing operation of the Government-owned tin smelter at Texas City, Texas, until June 30, 1949, was passed by Congress and approved by President Truman on June 28. Prior authority for the operation terminated June 30 of this year. There was little doubt in Washington that the bill would become law in short order.

Meanwhile, the Combined Tin Committee, at a meeting June 12, set final allocations for the world for the first half of 1947 at levels previously announced on an interim basis. The U. S. share in this was 9,326 tons. The committee had hoped for a greater dividend but a slump in production in the Far East prohibited it. Tentative allocations for the last half of the year were to be made at a meeting in Washington July 1.

Continuation of Government controls over tin, antimony, and several other scarce commodities was still before Congress at the end of June, but passage was assured. Even if controls are continued, however, pig tin stocks held by the Office of Metals Reserve will be "largely" depleted by December, the Office of Materials Distribution announced.

Present domestic allocation quotas to industry are expected to be continued as is, despite the indicated exhaustion of the Government stocks by the end of the year. Officials in charge of allocations are banking on the possibility of improvement of production in the Far East and elsewhere next year.

Stocks of the metal in the U. S. on April 1 totalled 75,496 long tons, a decline of almost 19,000 tons from the balance a year ago. Consumption during the first quarter amounted to 22,780 tons, which, under continuation of Government controls, is expected to be the average for succeeding quarters.

Data Required to Invoke Treaty Escape Clauses

The U. S. Tariff Commission has issued new rules for procedures in requesting investigations under the "escape" clauses in trade agreements.

These clauses provide that if trade concessions granted by the U. S. allow importation of a commodity in such increased quantities as to cause or threaten injury to domestic producers, the Government, on determination of the damage, can withdraw the concession or modify it.

The Commission makes the investigations on petition from the producer injured or threatened. Findings are to be reported to the President with appropriate recommendations.

With a clearly stated request for investigation, the applicant should file supporting information to aid the investigation. As far as practicable, the information should deal factually with imports, production, sales and exports of the product for the year 1937, 1939, 1946, and subsequent periods. Data should cover both the applicant and the industry of which he is a part.

Specifically, the Commission wants the following information included in the application: 1. Data on direct labor engaged in domestic production of the articles covered by application, including the number of persons employed during a normal period of operations in a representative year, as well as 1946; 2. The relation of income from the sales of the product to total receipts from all products produced by the applicant for pertinent years; 3. Comparability of the domestic and foreign product and the degree of competition between them, both prior to and subsequent to the trade agreement concession; 4. The geographic areas of the U. S. in which competition exists between the domestic and foreign commodities; 5. Data on profits and losses, changes in price structures, tax burden, wages and other costs, effects of subsidies and price support programs, and similar data that show the applicant's competitive position.

The Commission encourages informal conferences with its staff with regard to filing applications.

NEWS OF THE INDUSTRY

Lake Superior Safety Meeting Produces Wide Range of Useful Information; 600 Attend

In evident recognition of the principle that, if a mining company's safety work is to get results in reducing accidents, the company's top management must be sincerely interested in it, the address selected for opening the annual meeting of the Lake Superior Mining Section of the National Safety Council in Duluth on June 19 and 20 dealt with the viewpoint of management. The speaker was Rudolph T. Elstad, president of the Oliver Iron Mining Co., U. S. Steel's iron mining subsidiary in the Lake Superior district. It was the Oliver company's Rouchleau mine, on the Mesabi range, that recently won the U. S. Bureau of Mines 1946 "Sentinels of Safety" trophy, the award being for the accomplishment of working 894,346 man-hours without a lost-time injury (this record was increased to 1,250,000 man-hours by June 1).

Affirming his belief that accident prevention is an important part of the business of mining iron ore and that management has the initial responsibility and must provide all protection possible, Mr. Elstad added that every supervisor, as a member of management, shares this responsibility in safeguarding and protecting his men.

"Top management," he continued, "must be constantly aware of the changing trends in production methods in order to evaluate the factor of safety in each change and to mitigate and properly channel the many differences of opinion that arise from the personnel factor involved in this great humanitarian and industrially necessary endeavor.

"We have learned the hard way that, although the great motivating force behind the prevention of industrial accidents is the humanitarian desire to alleviate pain, suffering, death and its many attendant factors, an effective safety program inevitably results in increased productivity, decreased costs of operation, and a healthier, happier and much less volatile labor and industrial labor situation."

To meet management's responsibility for administering the policy epitomized in the Oliver slogan "Safety Must Be Our First Consideration," a safety program, according to the speaker, had to be continuous and vigorous. It must do three things:

1. Provide a competent and aggressive safety administration familiar with the industry's problem and able to analyze practices and recommend improvements.

2. Provide a control system for using and applying the knowledge and experience gained by the safety department.

3. Provide for constant review of results by top management and the proper dissemination of information and conclusion of such review.

"One of management's duties," continued Mr. Elstad, "is the building of good will and favorable public opinion. These valuable assets are based largely upon the treatment and consideration given employees, and no company can expect to stand high in public esteem when its mines or plants are known as man killers or widow makers."

The many wastes incurred when a man sustains a serious industrial injury, often greatly exceeding the money paid for compensation, medical treatment and hospital care, were sketched by Mr. Elstad. In the aggregate, the toll is immense. The speaker told of the parts played by various groups and individuals within the Oliver company in developing and supporting a safety program. Summarizing, he said that the four essentials of a safe operation are:

1. A management that directs and supports the accident-prevention program. 2. A high-grade safety department that can train and inspire the foremen. 3. A safety-minded group of foremen, as a part of management, who can train the workmen and get their cooperation. 4. Workmen who believe in accident prevention and who will support the efforts made.

The Safety Conference attracted a large number of mining men from the Lake Superior iron ranges, the registration exceeding 600. Byron G. Best, supervisor of safety for the Oliver company and general chairman of the Safety Council's Lake Superior section, presided. Other officers of the Section for 1946–1947 were J. P. Victor of the Castile Mining Co. on the Gogebic Range, vice chairman; Frank E. Cash, of the Duluth office of the U. S. Bureau of Mines, secretary; and E. W. R. Butcher, of the Republic Steel Corporation, treasurer. George W. Johnson, mayor of Duluth, welcomed the visitors.

Accident Severity Down, Frequency Up Slightly

Citing frequency and severity rates as yardsticks, the accident experience during 1946 at Lake Superior mines was analyzed and compared with that of past years by John H. Strome, assistant safety director for Inland Steel Co., at Ishpeming, Mich. The frequency rate for all iron mines in the district was slightly higher than in any of the seven years that such statistics have been compiled for the district, whereas the severity rate decreased substantially, being the lowest recorded in the period mentioned. One of the reasons for the latter was that the fatality rate for 1946 was the lowest on record, with only 12 fatalities or permanent total disabilities.

Summarizing, Mr. Strome found that for the seventh year the trend of the frequency rate was upward, the 1946 rate being double that for 1940. On the other hand, the severity rate, which had been upward for six years, declined to the lowest position in 1946. However, unless the number of accidents can be reduced, according to Mr. Strome, the benefits derived from a lower severity rate are not likely to continue.

Training in Supervision As a Remedy

The mining industry should attack the problem of controlling accident frequency and severity by applying basic principles, stated H. W. Heinrich, assistant superintendent, Travelers Insurance Co., in a paper on "Basics of Supervision." Employee injuries occur either because of a mechanical hazard existent in tools, equipment, structures, or other physical environment, or because of the unsafe action of some person. Unsafe employment performance predominates as a causative agency and here a basic approach can and should be made—through effective supervisory control.

The basic factors in supervision fall into four major groups, namely attitude, ability, knowledge, and action, according to the speaker. Emphasis gravitates with study to four basic factors under "action," to one of which, namely "prevention and correction," the speaker gave principal attention, outlining four methods—engineering revision; persuasion and appeal; personal adjustment; and discipline.

Four papers, respectively on blasting practices, fire prevention, welding, and open-cut transportation, were given at the afternoon session on June 19. The first, on "Blasting Practices in Metal Mines," by D. O. Kennedy, of the U. S. Bureau of Mines, was presented by F. G. Anderson. The Bureau has advocated electric blasting because the blasting can be controlled and the normal hazards of blasting

can be removed by well-installed electrical systems. A study of 588 metal and 195 nonmetallic mines shows that 8 of the first group and 11 of the second are using electric blasting exclusively and that 48 other mines use it to a limited extent.

Improvements have been made that are steps in the right direction but accidents continue.

Mines making limited use of electric blasting introduce new hazards of stray currents and premature blasts unless safeguards are used. Those using electric blasting exclusively provide such safeguards.

The miner is not expected to be an electrician. Planning and preparation are necessary. Electric blasting, thus conducted, is responsible for certain excellent records made.

Fire Prevention Practice in the Iron Country

A lengthy report on "Fires and Fire-Prevention Practices in Lake Superior District Iron Mines," by Carl N. Fellman, of the Montreal Mining Co., on the Gogebic Range, was presented next. The underground mines of the district have had 11 serious fires in the last six years, 77 minor fires and numerous short circuits in power, light and trolley lines. That lives were not lost indicates the effectiveness of the fire-fighting programs and organizations, as well as of the ventilation systems, but the large number of fires shows that mine organizations must always be alert and prepared.

Complete data supplied by the companies on the fires mentioned, as well as on their programs for preventing and fighting fires are contained in Mr. Fellman's report.

Practical comment and advice on the use of welding, both electric and oxyacetylene, and its advantages were given by M. M. McElderry, technician with W. P. and R. S. Mars Co., of Duluth, at this session. The application of arc welding has grown enormously in the past decade.

Safety in open-cut transportation was discussed by A. C. Tancig, general mechanical superintendent for the Snyder Mining Co., Chisholm, Minn. Speaking of rail haulage, the speaker said that all time-proven safety rules are observed. Accident prevention is considered a part of an efficient operation. In selecting its first trucks the company decided on trailer units partly because of their greater brake area per ton of load. Power steering and a comfortable driver's seat were insisted upon, also a full spring truck unit—all these to reduce the driver's fatigue. Each truck was equipped with an approved fire extinguisher of ample size. Attention is paid to construction, width and curves of the main roads. Scotch-lite markers are provided for night driving. Calcium chloride is used for dust prevention. Engine hoods are painted with nonglare paint to eliminate light reflection. Proper maintenance of tires, steering, brakes, and lights by qualified persons is vital to safe operation.

Regarding belt conveyors used in open-pit transport, they present few hazards but certain fundamentals must nevertheless be observed, such as to provide for proper loading lest large pieces of ore roll off. The same applies to power shovels, tractor-dozers and motor patrols.

Hazards connected with underground haulage and the safeguards that will minimize them provided the topic for the paper presented by J. P. Victor, of the Castile Mining Co. on the Gogebic Range, at the first session on the following day. Underground haulage is highly mechanized and electrified today, presenting hazards more difficult to deal with than formerly.

Scrapers and tugger hoists present new hazards. Injury may result if a man is caught by the moving scraper. Therefore men must stay out of the scraper travelway when the motor is running. Whipping ropes may injure the man signalling, so signalling should be done from a guarded vantage point between tugger and muckpile. A tugger must be rigidly spragged at top front and sides lest the hoist tip toward the raise or overturn on heavy pulls. Electric tuggers are grounded but if connections become loose, shock hazards may be created.

Electric haulage calls for many precautions. Chute loading of cars is always hazardous. Tram cars should be kept in good repair. In dumping rocker-dump care is needed lest the dumping struts or bar hurt a man or the cars roll back suddenly when sticky ore is left in them.

Commenting on the use of color in plants to promote safety, Raymond F. Clow, safety engineer on the War Department General Staff, said that color schemes are intended to be supplemental to, and not substitutes for, sound accident elimination work. Use colors, he advised, which have certain popular meanings, and use them sparingly. Stick to a few. Don't change popularly accepted basic color schemes. Standardize both on color and on shape or design (of signs). The overall painting of plant interiors is in itself an important factor in accident prevention as well as in its effect on the usefulness of accident-prevention color schemes.

Hazards connected with dust and fume collection were discussed by Ernest F. Orrick, engineer with the Walker Jamar Co. of Duluth. Ways of controlling them include: (1) Change in process of operation (as from spray painting to dipping). (2) Substitution of wet for dry-grinding material (use of non-explosive solvents). (3) Enclosing source of dust or fumes (hoods or covers). (4) Isolation and separation of worst offenders (spray booth—sand blast room). (5) Exhaust collection systems and general ventilation. (6) Good housekeeping (flushing of dry-house floors, brushing down of rafters and pipes, etc.). The speaker considered No. 5 as the most useful of these methods of control.

"Off-the-Job Accident Prevention" was the subject of the concluding speaker, John M. Roche, manager of the Safety Council's Industrial Department. "The off-the-job problem *is* our business," said Mr. Roche. "It should be recognized as such. It is also a public problem." He pointed out that about 170 of the 500 killed in the United States every two days are workers away from their work. Because of his interest, the employer should attempt to reduce the hazards faced by his people. Few plants keep good enough records to understand fully the seriousness of the off-the-job problem.

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Drilling Practice Reviewed at A. I. M. E. Meeting

E. H. Dickenson, of the Ingersoll-Rand Co.; H. J. Longmore, of Sprague and Henwood, Inc.; and Gordon Jackson, of the Eastman Corporation, participated in a symposium on drilling practice held before the New York Local Section, A.I.M.E., May 28, 1947.

Discussing "Sintered Tungsten Carbide Bits," Mr. Dickenson said that the bit is still in the experimental stage. He expressed the belief that American operators would ultimately select drills heavier than those used with tungsten carbide bits in Europe, but somewhat lighter than the heavy types now used here.

In one Norwegian tunnel job which he described, five jackhammers were used to drill a 16x13-ft. face. They drilled forty 12-ft. holes per round using tungsten carbide bits. Drilling, loading and firing were completed in 2 hr. and 40 min. Advance averaged one foot per man-shift.

He also described a large Swedish project employing 2½-yd. shovels for mucking. Light jackhammers were used, with hard-metal inserts in the drill steel. The jackhammers were

WELL-KNOWN FIGURES of the Western mining industry are identified in this group of delegates and guests who attended the annual convention of the Idaho Mining Association at Sun Valley on May 23 and 24. Gov. C. A. Robbins of Idaho (sixth from right in foreground) stands between J. B. Haffner and John D. Bradley, incoming and outgoing presidents of the association.

mounted in a section of channel iron, and advanced to the face by a bicycle chain drive powered by an air motor. When the jackhammer reached the face, the direction of travel was automatically reversed. One man operated two drills. Drilling speed was 10 to 12 ft. per min. Drill bits were $1\frac{7}{8}$ in.

Mr. Longmore reviewed the status of diamond and shot drilling. He said he expected that drilling equipment would soon be standardized to produce holes of the following approximate sizes large than NX holes: $3\frac{3}{4}$ in., $5\frac{1}{2}$ in., and $7\frac{3}{4}$ in.

Mr. Jackson demonstrated equipment used to survey oil wells, and described two types of devices to deflect drill holes. One was a wedge or whipstock, and the other consisted of a knuckle or universal joint with spring to hold the drill at a fixed angle. Deflecting equipment was used 2,700 ft. below the collar of a hole in one Canadian mine. Deflections were made in three directions to pick up a displaced vein.

Rule 221-H of S.E.C. Act Is Repealed

Rule 221-H of Regulation A of the Securities Act of 1933 has been repealed according to an S.E.C. advice dated June 13, 1947. Opposition to this rule had been expressed at the February meeting of the Colorado Mining Association, and at other previous conferences with S.E.C. officials.

Rule 221-H provides that securities shall not be exempt from registration if "sold or delivered after sale in . . . a State while the right to offer or sell securities in that State is prohibited, denied, or suspended by any regulatory body of the State for any reason other than the misconduct of a dealer in securities."

Talks Enliven Meeting of Idaho Mining Association

Labor was a leading topic of discussion at the 18th annual convention of the Idaho Mining Association held at Sun Valley May 23 and 24. The two-day sessions also covered phosphate fertilizer developments, atomic energy, barite, and the economics of antimony. About 200 persons attended. J. B. Haffner, general manager of Bunker Hill & Sullivan Mining & Concentrating Co., was elected president to succeed John D. Bradley, president of Bradley Mining Co.

William J. O'Connor, manager of the Garfield, Utah, smelter of American Smelting & Refining Co., spoke on "Post-War Handling of Labor"; his remarks are discussed editorially elsewhere in this issue. Oscar W. Worthwine, of Boise, reviewed recently enacted and pending labor legislation. Labor's viewpoint was interestingly presented by Charles E. Duffy, a member of the AFL who formerly served on the State Industrial Accident Board, in a paper entitled "The Closed Shop and What Stems From It." Roy S. Hooper, assistant mine superintendent for Bunker Hill & Sullivan, discussed mine labor.

The occurrence and uses of barite were described by John Coulter Steward, manager of Sun Valley Barite Mining Co., which is working a potentially large deposit near Hailey, Idaho.

Dealing with "The Postwar Antimony Situation," James P. Bradley, vice president of Bradley Mining Co., expressed the belief that Idaho will be the most important future world source of antimony and said that the Chinese antimony industry remains completely disrupted. Postwar U. S. demand for the metal, due to new and increased uses, is much higher than prewar and cannot at present be met. He mentioned the existence of enormous reserves of low-grade antimony ore in central Idaho and potential areas in other Western states, pointing out that domestic production could be greatly increased if adequate smelting facilities were located near the mines; also, existing smelters which were built to handle imported crude oxide ores cannot usually treat domestic sulphide flotation concentrates. The Yellow Pine mine of Bradley Mining Co. is now producing antimony at the annual rate of 6,000 tons. Bradley contrasted this figure with a prediction made by the United States Tariff Commission in a 1945 report that postwar domestic production would probably not exceed 600 short tons a year.

T. C. Butler, chief engineer of the J. R. Simplot Co., Boise, announced the company's plans to develop the Idaho phosphatic shales as a major source of fertilizer. So-called "high-grade rock", grading 30% P_2O_5 or higher, is required to make fertilizer by the wet acid process. The large-scale open-pit mining methods employed by the company entail mining three to five tons of phosphatic shales, running 22 to 27% P_2O_5 for every ton of high-grade rock used. When stockpiled these shales rapidly deteriorate and are practically wasted. Studies have indicated that the best way to salvage the shales is by melting out the metallic phosphorus in electric furnaces, making phosphoric acid for 47% triple superphosphate, for which there is a great need. Preliminary drilling indicates an adequate supply of the shale for 25 years' furnace operation. Pilot plant tests are expected to confirm laboratory results, in which event construction will start in the fall of 1947, with production scheduled for late 1948.

NEW BOOKS

FREE GOLD. By Arnold Hoffman, with illustrations by Irwin D. Hoffman. Published by Rinehart & Co., Inc., 232 Madison Ave., New York 16, N. Y. Pp. 392. Price $5.00.

The secondary title of this book tells us it is "the story of Canadian mining." It is much more than that. It is a colorful yet undistorted portrayal of the elements and personalities which have figured in the meteoric growth of Canada's mining industry since the turn of the century. If some of the episodes seem fantastic it is because the record has been fantastic. Far from being a tedious recital of facts, dates and statistics this book combines a warm appreciation of human nature with a keen understanding of the technical and economic aspects of mining. Nearly all of the book deals with events mining men of today can recall. In this respect it is virile and stimulating by comparison with books which reminisce on the bygone glory of ghost mining camps.

For many readers the chapter on "Mine Makers" will be a highlight. Here the author parades against the backdrop of Cobalt, Porcupine, Kirkland Lake, Rouyn, Malartic, Red Lake, Yellowknife and other backbone areas of present-day Canadian mineral production the careers and personalities of the "greats," the men of vision and tenacity, most of them still living and active, who have wrought mines out of muskeg: Timmins, Lindsley, Hammell, Waite, Gamble, Jowsey, Bryce, Delamar, Oakes, Norrie, Connell, and others. Other chapters call the roll of Canada's famous prospectors, probably the world's hardiest group of individualists, who could well provide the material for an entire book. A separate chapter on the late Sir Harry Oakes gives an intimate and intriguing character sketch of the discoverer of the Lake Shore mine whose death by violence in the Bahamas a few years ago is still an unsolved mystery.

For the uninitiated a chapter, with illustrative sketches, is devoted to a layman's discussion of mineral deposits, what they are, how they are formed, the nature of the Pre-Cambrian shield, and how prospects are developed into mines. On a more technical level, in a following chapter, the author points out that the era of easy surface discoveries is over and that prospecting methods of an earlier day are giving way, perforce, to the more precise techniques of detailed geological study and applied geophysics. The Quemont mine is a recent case in point.

The author's narrative talent is perhaps at its best in a chapter dealing with the discovery of the Flinotin Flonneroy property by a prospector on the trail of a moose. The patch of rock swept free of snow and exposing sulphides which he suddenly saw grew into the great Flin Flon enterprise.

Arnold Hoffman is an American geologist who cast his lot with the north country 25 years ago. In 1922, while a student at Harvard, he followed his mining engineer brother to Canada and caught the prospecting fever. The two brothers teamed up and have been traveling the bush, staking claims and developing mines ever since. From the early beginnings of Rouyn and the Noranda project to the discoveries which have made Yellowknife Canada's newest gold-producing field, the Hoffman brothers have been found in the thick of prospecting, exploration and development. Arnold Hoffman's book is authentic. It represents the piecing together of notes and observations painstakingly kept by the author day by day over the entire period of his mining experience. The component chapters, each in a sense a story by itself, are skilfully blended to produce a running narrative. The conversational style contributes to easy reading. A glossary of mining terms is appended.

The illustrations are by brother Irwin D. Hoffman, a distinguished artist well known for his paintings and sketches of mining subjects. His prospectors look like prospectors and Klondike Jessie looks like Rouyn's first blind pig operator.

MINE DUST CONTROL. By M. I. Signer, S. M. Yurdakos and B. M. Sarp; Colorado School of Mines Quarterly, January 1947. Published by Colorado School of Mines, Golden, Colo.; price $1.00; Pp. 64.

A general review of the nature and causes of pneumoconiosis, causes and control of mine dust, including some field and laboratory studies of the amount of ventilation necessary to maintain permissible conditions in drifts, and of the effectiveness of water sprays.

MISSOURI BASIN STUDIES, NO. 10. Resource map of Colorado. U. S. Geological Survey. Price, $0.80.

This the latest in a series of State resource maps being compiled by the U. S. Geological Survey in connection with the Interior Department's program for developing the Missouri River Basin. Prepared with the cooperation of the Colorado State Geological Survey Board and the Colorado Metal Mining Fund, the map depicts geological classifications in color, together with the locations of nonmetallic mineral deposits and rocks suitable for construction material. The scale is 1:500,000. Copies may be purchased for 80c. from the Director, Geological Survey, Washington 25, D. C., and at the Geological Survey offices at 314 Boston Building, Denver.

SIX-PLACE TABLES. Seventh edition with explanatory notes by Edward S. Allen, Professor of Mathematics, Iowa State College. McGraw-Hill Book Co., Inc., 330 W. 42nd Street, New York 18, N. Y. Price $2.50. Pp. 232.

A convenient pocket-size book of six-place tables and useful formulas. The following are included: Tables of squares, cubes, square roots, cube roots, fifth roots and powers, circumferences and areas of circles, common logarithms of numbers and of the natural trigometric functions, natural functions, natural logarithms, and exponential and hyperbolic functions.

INTERNATIONAL CONTRACTS AND THE ANTI-TRUST LAWS. By Harry Aubrey Toulmin, Jr. Published by W. H. Anderson Co., Cincinnati, O. Pp. 1068. Price $15.

The object of Mr. Toulmin's work is to show business men how to negotiate and draft sound international contracts and avoid anti-trust violations. Citizens and corporations who have entered into contracts with foreign nationals have frequently run into trouble because the laws of their respective countries have not been observed or fully understood by the contracting parties, or if understood, have been ignored to their subsequent peril and disaster.

Among the topics treated in this book are Cartels and Counter-cartels; Reciprocal Trade Agreements; Import Trade Practice; Cross-Licensing; Foreign Anti-Trust Laws; Patent Pooling Agreements; Analysis of the General Electric-Krupp agreement; Wilson Tariff Act; Panama Canal Act and the Civil Aeronautics Act.

INDUSTRIAL DIRECTORY OF MEXICO. Publicaciones Rolland, Plaza de la Republica, No. 6—407, Mexico, D. F., Mexico. Pp., 1,024. Price $20.00.

The publishers state that this is the first industrial directory ever compiled for Mexico. The aim was to list all Mexican industrial companies with their addresses, names of officers, raw materials used, products manufactured, and number of employees. A special Spanish-English dictionary will be included for U. S. purchasers.

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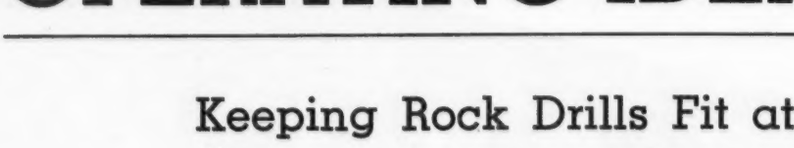
OPERATING IDEAS

Keeping Rock Drills Fit at Homestake



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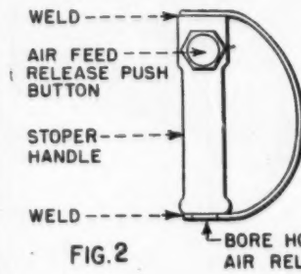

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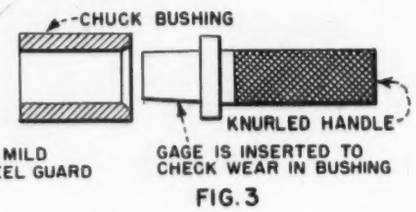

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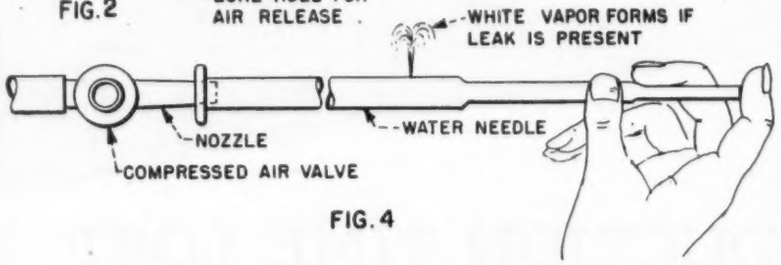

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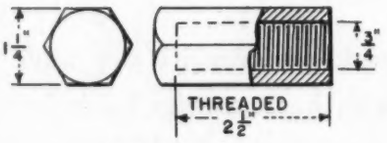

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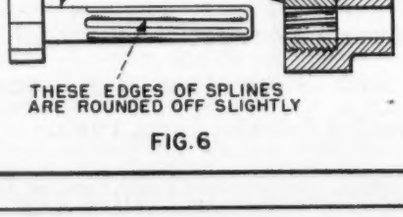

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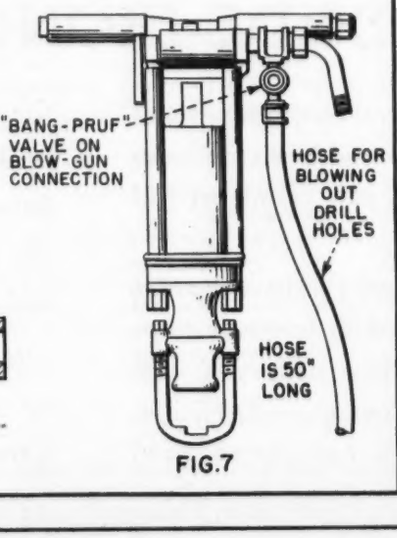


FIG. 7

Here is a group of operating ideas pertaining to rock drills and their maintenance that experimental engineers and mechanics at the Homestake Mining Co., Lead, S. D., have found to be useful. Some of them have been used for a number of years, and others are now incorporated in rock drills on the market.

Air Hole in Exhaust Port of Drifter to Clean Feed Screw. Rock dust which adheres to the exposed lubricated surfaces of feed screws on drifters causes rapid wear of these parts. This leads to poor alignment of the drill during drifting, and causes broken steels. Homestake mechanics solved this problem by drilling a small hole in the exhaust port of the drifter which directs a continuous jet of air against the feed screw as the drill advances during drilling. See Fig. 1. The oil present in the exhaust air lubricates the feed screw as well.

Guard on Stoper Handle Protects Operator's Hands. When steel in a self-rotating stoper gets stuck, the operator's hand on the stoper handle may be thrust against a rock wall. The guard shown here is welded on the handles of stopers to prevent these injuries. See Fig. 2.

"Go-No-Go" Gage to Test Chuck Bushings. Rock drill chuck bushings must be discarded after they are worn beyond certain permissible limits. The gage shown in Fig. 3 was designed to enable mechanics to check bushings for excessive wear. It is machined to close tolerances. If inserted into a bushing, it quickly reveals whether wear is excessive or not.

Quick Test for Leaky Water Needles. A pin-hole leak in a water needle can do plenty of damage to the inside of a rock drill, chiefly because it directs a steady jet of water against one part of the drill, and washes away lubrication from that point. These tiny leaks are sometimes hard to detect. An easy test is made on all water needles at Homestake before they are in-

stalled. First, a few drops of penetrating oil are poured into a water needle. Then one end is sealed with a finger as shown. Finally, compressed air is introduced through the opposite end. If a hole is present, no matter how small, a conspicuous white fog will escape through the opening to expose the defect. See Fig. 4.

Water Needles Are Shortened. To prevent the frequent breakage of water needles, all water needles are cut back so that the end of the tube is about ¼-in. back of the striking face of the tappet when the tappet is in the rear position inside the tappet rotating sleeve.

Keeping Side Rods Tight With Solid Nuts. Loose side rods on rock drills are a frequent cause of delay. They may loosen up even if two nuts are used to lock the rods in position. Mechanics machined a long closed nut, as shown, and found that side rods fitted with them remained tight. The closed end of the nut prevents peaning of the rods. Although many drills are now fitted with these nuts, mines employing older types of machines will find this idea useful in keeping side rods tight. See Fig. 5.

Solid Shell Cuts Repair Costs. Mechanical engineers at Homestake have long been advocates of a solid guide shell for crank-feed drifters (now incorporated in the design of some rock drills) in preference to types which employ crossheads, rods, and spreaders to support the feed screw at the rear of the shell. The solid shell with a single bushing in the casting keeps the feed screw in perfect alignment, whereas crossheads and bolts supporting feed screws can loosen up, or be bent when the machine is dropped, thus causing excessive wear of the feed screw and shell guideways. It is estimated that feed-screw repairs were cut by 75% with the solid shell.

Rounded Splines Prevent Rifle-Nut Wear. Homestake mechanics recommend that square-edged splines on rifle bars be rounded off and polished, and that the flutes be polished, to give longer life to the rifle bars and rifle nuts. Experience has shown that these improvements reduce repairs and replacements without interfering with efficient operation of the drills. Some drills now incorporate these features. See Fig. 6.

Blowing Hose Fitted to Sinkers. The short length of blowing hose attached to sinkers as shown here has long been popular with Homestake miners, and is standard equipment on all sinkers. A few blasts of air controlled by the Claflin "Bang-Pruf" valve near the handle will free any down hole of water and chips. In practice, the miners insert the end of the hose in the drillhole and step on it to hold it in place before blowing the hole. See Fig. 7.

Simplified Pump Repairs

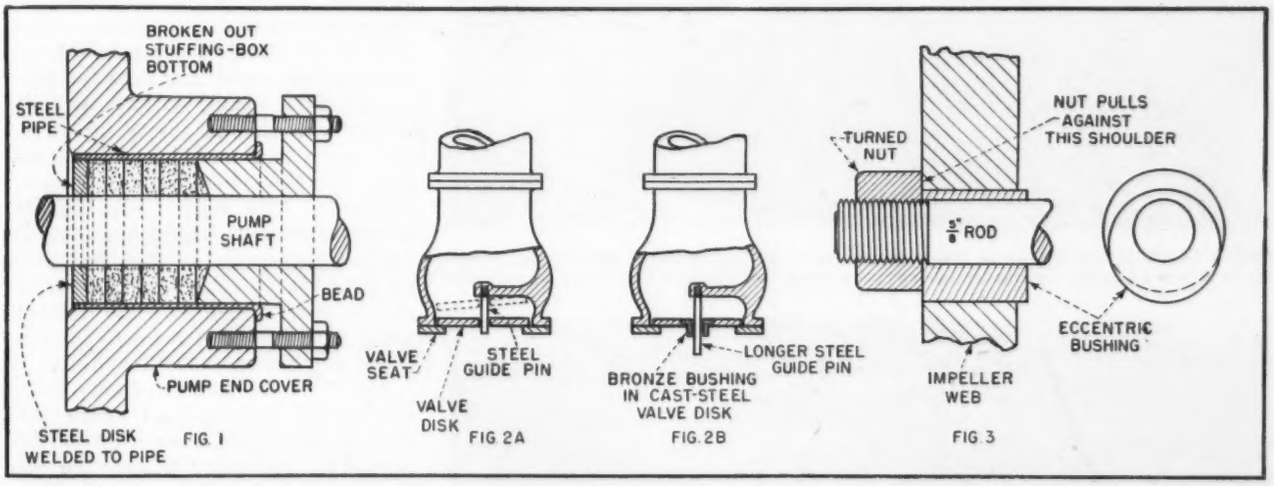


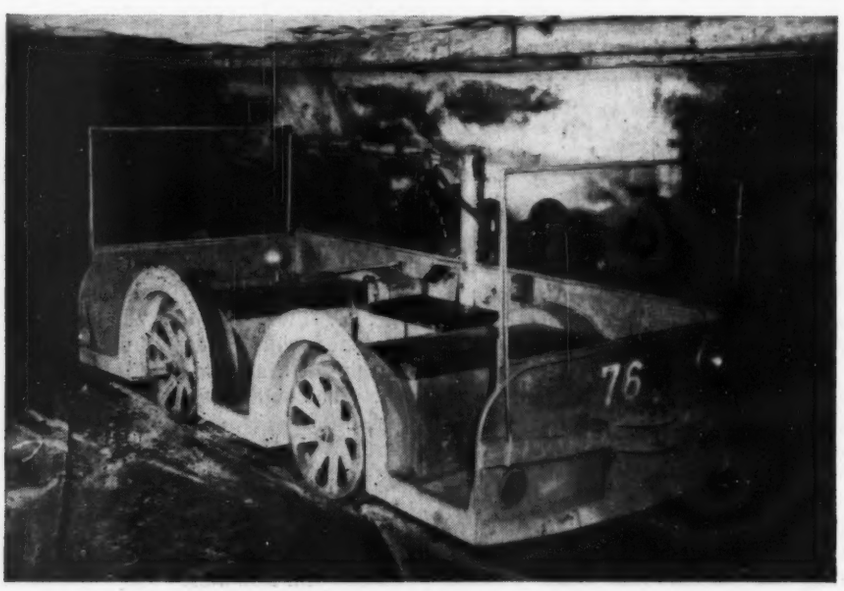
Fig. 1 shows a simple way to repair a broken stuffing box of a pump. A sleeve, with disk welded to one end, is inserted in the stuffing box. Then the sleeve is expanded with a boiler-tube expander, and beaded on the outer end. Finally, the stuffing-box flange is turned down to fit inside the sleeve, inserted in the stuffing box and drawn up.

In one Arizona mine, a leak in a foot valve was caused by a valve disk which hung up on a steel guide pin as shown in Fig. 2A. To repair this defect, the valve disk was fitted with a bronze guide bushing, and a longer guide pin was installed as shown in Fig. 2B. The repaired valve has performed perfectly for more than two years.

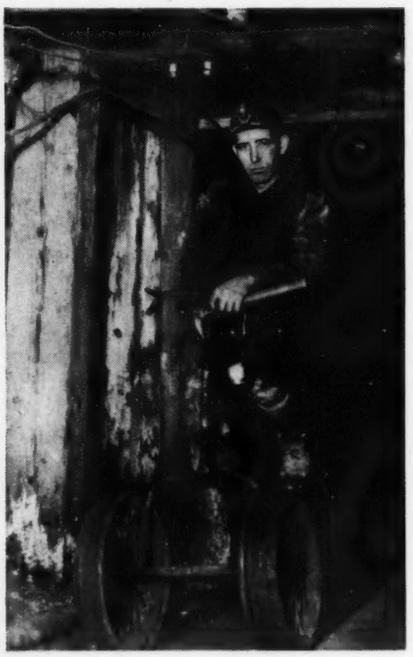
Often impellers must be removed from multi-stage centrifugal pumps to repair rings and bushings in the diaphragms between the impellers. With the impellers tight on the shaft, and the diaphragms separating the impellers, it is impossible to get a nut on the end of the pulling rod which has been pushed through the holes provided in the web of the impeller. A copper mining company solved this problem by using special bolts like the one in Fig. 3. Two steel draw-bolts with hardened round nuts, and two eccentric bushings are needed for the job. The ends of the draw-bolts, with nuts attached, are pushed through the holes in the impellers. Eccentric bushings are slipped over the rods and into the impeller holes. The rods cannot be pulled through the holes, because the nuts shoulder against the impeller.

Three Ways of Getting Around Fast

SHAFT CREW lowers a jeep at one of the mines of the International Salt Co. in Detroit, Mich. It will be used to transport passengers around the mine and as a light utility truck.



THIS ELECTRICALLY OPERATED "mine jeep" is another means of quick transport on main haulage levels. Coal Age photo.



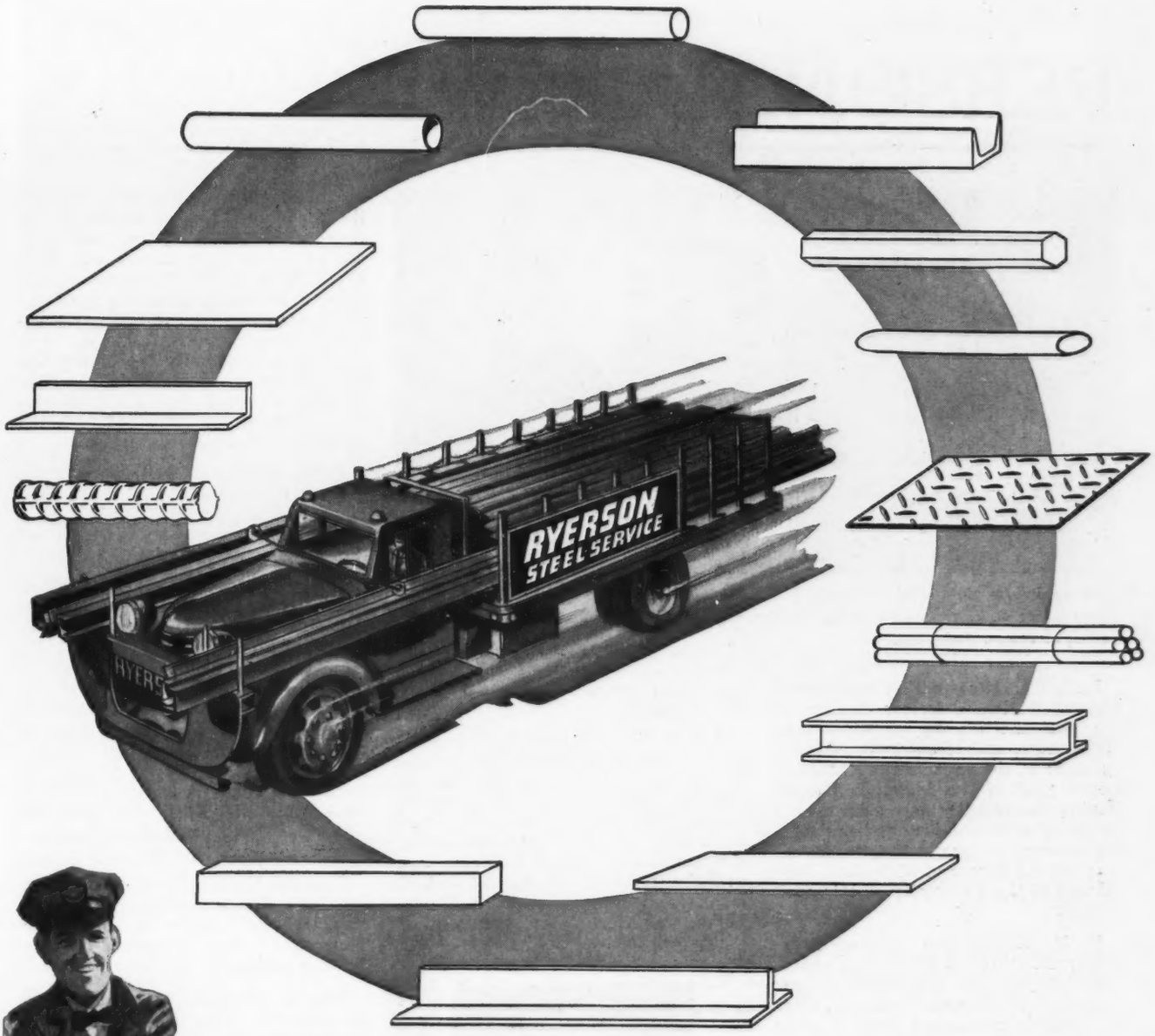
PEDAL-OPERATED CARS of this type are available for track gages ranging from 18 in. to 6 ft. They are ideal for supervisors.

Now that mine crews travel from the portal to the face on "company time" it is economical to transport them to their working places as rapidly as possible. Some mines have used special passenger cars for this purpose for years. Others permit workers to ride in empty ore cars. But much "leg work" is still necessary for shift bosses, supervisors, samplers, and safety and repair crews. Frequent delays are experienced when mining or mucking crews have to take time off while one member walks to some distant point for a side rod for a drill, or a chain for the mucking machine.

The types of vehicles shown here can reduce delays, and spare the energy of skilled and high-priced personnel for more productive effort. They may be exceptionally valuable in event of a fire, injury, or other emergency.

The gasoline-powered jeep operates in a well ventilated salt mine carrying crews of seven men, and tows trailers carrying 20 men.

Electrically operated "mine-jeeps" of the battery, trolley, or trolley-and-battery type are equally useful. The pedal-operated type has many obvious advantages.



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RYERSON STEEL

PERSONAL NEWS

Reading left to right: Dr. Frederich A. Middlebush, president of the University of Missouri; Dr. L. E. Young; Dr. Russel B. Caples; and Dr. Curtis L. Wilson, dean of the School of Mines, Rolla, Mo.

L. E. Young, consulting engineer of Pittsburgh, Pa., a former director of the Missouri School of Mines and Metallurgy and **Russel B. Caples**, manager of the Great Falls Reduction Department of the Anaconda Copper Mining Co., recently were awarded the honorary degree of doctor of engineering (honoris causa) at the commencement of the School of Mines and Metallurgy of the University of Missouri, at Rolla.

P. H. Ensign has succeeded his father, **A. C. (Gus) Ensign**, as superintendent of the Kennecott Copper Corporation's Magna, Utah, mill, after the latter's retirement June 1 after serving the company 43 years. The elder Mr. Ensign became general foreman of the Magna mill in 1913, assistant superintendent in 1923, and superintendent in 1938. The younger Mr. Ensign is a graduate of the University of Utah. He began his service with the company at the Arthur mill assay office, where he was successively chemist in the research department and a mill shift boss. He became general foreman of the Magna mill in 1945.

T. H. Cain has been made assistant superintendent of the Godfrey-Morris mine of Oliver Iron Mining Co., at Chisholm, Minn., and **Carl R. Burton** has been advanced to the post of assistant superintendent of maintenance for the district.

Arthur E. Bernard has succeeded the late Matt Murphy as Inspector of Mines for the State of Nevada.

H. G. Washburn has retired as general manager of operations for the Federal Mining & Smelting Co. and affiliated companies, at Wallace, Idaho, after serving 17 years. **J. E. Berg**, also of Wallace, assistant general manager, has assumed the post held by Mr. Washburn.

J. B. Haffner has been elected president of the Idaho Mining Association, at Wallace, Idaho, succeeding John D. Bradley. Mr. Haffner is manager of Bunker Hill & Sullivan Mining & Concentrating Co., and Mr. Bradley is vice president of Bradley Mining Co., at Stibnite, Idaho. **A. H. Shoemaker**, manager of Triumph mine, at Hailey, Idaho, was elected vice president of the association.

WALTER E. SCOTT, JR.

Walter E. Scott, Jr., is continuing his consulting office in Central City, Colo. He is consultant for the Terrible-Dunderberg and Mendota mines, at Silver Plume, the Rollins placer, near Central City, and the Joe Dandy mine, at Cripple Creek. **Harvey L. Tedrow**, his associate, is manager of the El Paso mine, Cripple Creek.

At the 193d annual commencement exercises of Columbia University, New York, **Dr. Frank D. Fackenthal**, acting president of the University, conferred the honorary degree of Doctor of Science on **Louis S. Cates**, president, Phelps Dodge Corporation, and **Harvey S. Mudd**, Pacific Coast mining engineer. **Albert H. Case**, vice president and general manager of General Phosphoric Products, New York, was awarded a University Medal for Excellence for his contribution to "the finding and development of Tennessee copper sulphite, thus adding to the country's industrial resources."

D. H. Angus, of Haileybury, Ont., was elected president of Consolidated Beattie Mines, Limited, Quebec, at a recent meeting of the directors of that company.

Percy W. Donovan has resigned as vice president and manager of the Contract Drilling Division of E. J. Longyear Company as of June 6, 1947, after completing 42 years of active service. He was elected to the board of directors in 1916 and will continue in this capacity for a time and, in addition, will serve as consulting engineer. Effective June 6, **Vincent N. Burnhart** will be manager of the Contract Drilling Division. Mr. Burnhart joined Longyear early in 1946 as assistant to Mr. Donovan.

Gonzalez Videal, President of Chile, and **Luis Bossay**, Minister of Economy, went to Copiapo on June 17 to inaugurate the Paipote Copper Smelter works.

John E. Bowenkamp has returned to Sullivan, Missouri, on a three months' leave of absence from South America, where he was engaged in mine examination and exploration work in Peru and other countries for Wellington Explorations, Ltd., a subsidiary for Latin America of the N. A. Timmins Corporation of Montreal, Canada.

Dr. R. R. Sayers, Director of the Bureau of Mines, has designated **Samuel A. Gustafson** as acting supervising engineer at Denver. He has been with the Bureau since 1940. Gustafson is a graduate of the Colorado School of Mines.

Donald H. McLaughlin, president of the Homestake Mining Co. of Lead, S. D., has accepted the chairmanship of the program committee for the 1947 Metal Mining Convention of the American Mining Congress, to be held at El Paso, Tex., Oct. 27-29. The convention is sponsored by the Western Division of the Mining Congress, headed by **H. M. Lavender**, vice president and general manager of Phelps Dodge Corporation, Douglas, Arizona.

Hugh Bein, geologist, has joined

STANDARD ENGINEERS NOTEBOOK

Standard Diesel Fuel lengthens injector life

Many Diesel engine operators have minimized fuel system trouble and made parts last longer by the use of 100%-clean Standard Diesel Fuel.

This special fuel is manufactured from the finest crudes and is completely distilled. Numerous checks and rigid control during manufacture assure a uniform high-quality product with just the right body to lubricate all parts in engine fuel systems.

To prevent contamination, Standard Diesel Fuel is handled in separate pipelines, tankcars, trucks and containers. It comes free of grit and moisture, the principal causes of injection valve wear.

Standard Diesel Fuel flows freely and atomizes completely. It burns smoothly, producing maximum power in engines.

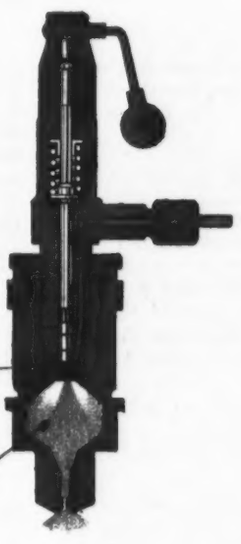
It is recommended for all Diesel engines except those requiring a special high-cetane fuel where Standard Locomotive Diesel Fuel and Standard Automotive Diesel Fuel are recommended.

Standard Diesel Fuel is specially stored and shipped to insure 100% cleanliness.

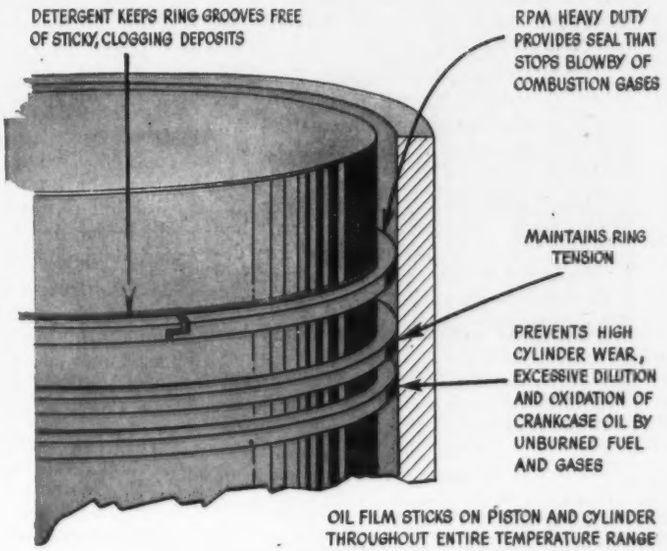
Has sufficient body to lubricate fuel pumps and other moving fuel-system parts.

Will not plug tiny injector openings or cause extra wear.

Atomizes completely.



Typical Injection Valve.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MAINTAINS RING TENSION
PREVENTS HIGH CYLINDER WEAR, EXCESSIVE DILUTION AND OXIDATION OF CRANKCASE OIL BY UNBURNED FUEL AND GASES
OIL FILM STICKS ON PISTON AND CYLINDER THROUGHOUT ENTIRE TEMPERATURE RANGE

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Mine products in their primary state give valuable conveyor belting severe wear. That's why replacement of belting should be the subject of careful study in every mining operation. Thermoid recognizes the unusual wear conditions of this service and includes in its line belting of exceptional toughness that pays off in terms of maximum tonnage per belt-dollar.

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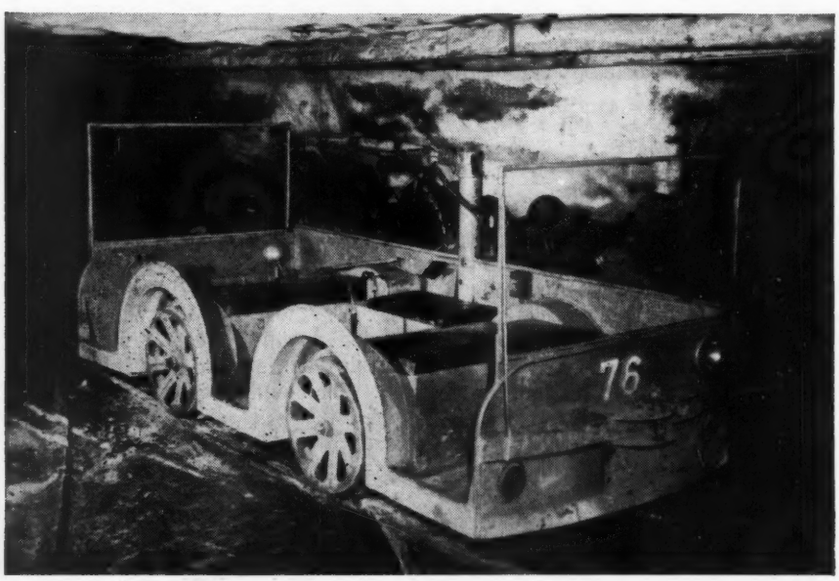
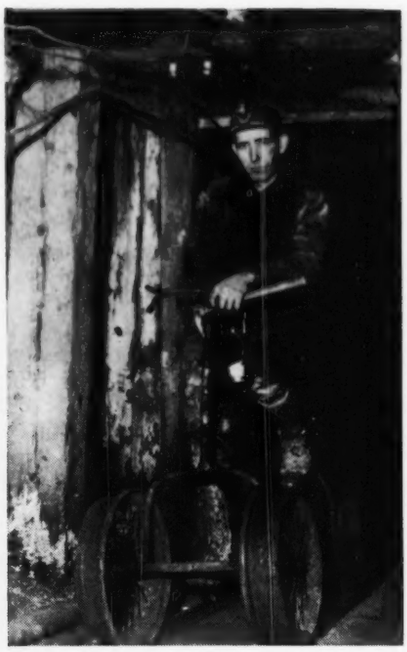
Three Ways of Getting Around Fast

SHAFT CREW lowers a jeep at one of the mines of the International Salt Co. in Detroit, Mich. It will be used to transport passengers around the mine and as a light utility truck.





PEDAL-OPERATED CARS of this type are available for track gages ranging from 18 in. to 6 ft. They are ideal for supervisors.

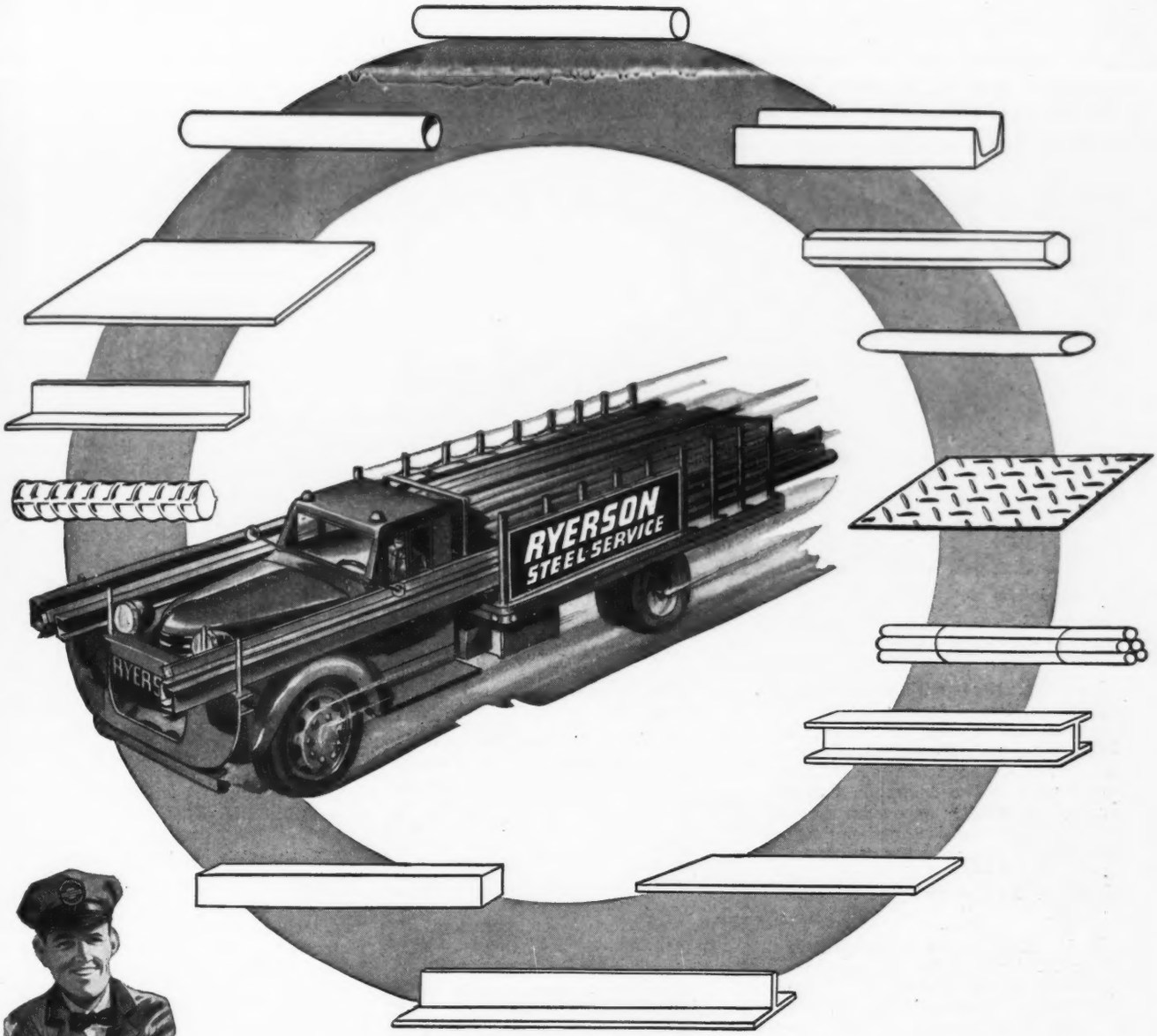
Now that mine crews travel from the portal to the face on "company time" it is economical to transport them to their working places as rapidly as possible. Some mines have used special passenger cars for this purpose for years. Others permit workers to ride in empty ore cars. But much "leg work" is still necessary for shift bosses, supervisors, samplers, and safety and repair crews. Frequent delays are experienced when mining or mucking crews have to take time off while one member walks to some distant point for a side rod for a drill, or a chain for the mucking machine.

The types of vehicles shown here can reduce delays, and spare the energy of skilled and high-priced personnel for more productive effort. They may be exceptionally valuable in event of a fire, injury, or other emergency.

The gasoline-powered jeep operates in a well ventilated salt mine carrying crews of seven men, and tows trailers carrying 20 men.

Electrically operated "mine-jeeps" of the battery, trolley, or trolley-and-battery type are equally useful. The pedal-operated type has many obvious advantages.

THIS ELECTRICALLY OPERATED "mine jeep" is another means of quick transport on main haulage levels. Coal Age photo.



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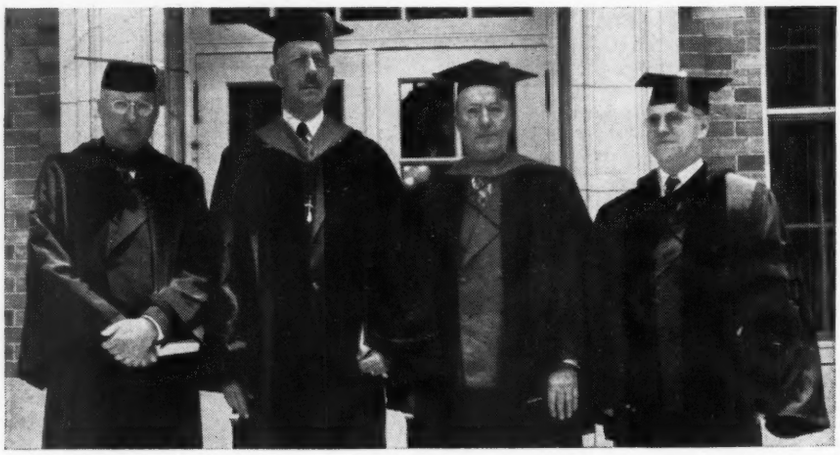
PLATES & SHEETS—Including Inland 4-Way Floor Plate	BARS—Carbon & alloy, hot rolled & cold finished	TUBING—Seamless & welded mechanical tubing, boiler tubes
STRUCTURALS — I beams, H beams, channels, angles, etc.	STAINLESS — Plates, bars, angles, tubing, etc.	OTHER PRODUCTS—Chain, wire rope, Babbitt metal, etc.

RYERSON STEEL

PERSONAL NEWS



Reading left to right: Dr. Frederich A. Middlebush, president of the University of Missouri; Dr. L. E. Young; Dr. Russel B. Caples; and Dr. Curtis L. Wilson, dean of the School of Mines, Rolla, Mo.

L. E. Young, consulting engineer of Pittsburgh, Pa., a former director of the Missouri School of Mines and Metallurgy and **Russel B. Caples**, manager of the Great Falls Reduction Department of the Anaconda Copper Mining Co., recently were awarded the honorary degree of doctor of engineering (honoris causa) at the commencement of the School of Mines and Metallurgy of the University of Missouri, at Rolla.

P. H. Ensign has succeeded his father, **A. C. (Gus) Ensign**, as superintendent of the Kennecott Copper Corporation's Magna, Utah, mill, after the latter's retirement June 1 after serving the company 43 years. The elder Mr. Ensign became general foreman of the Magna mill in 1913, assistant superintendent in 1923, and superintendent in 1938. The younger Mr. Ensign is a graduate of the University of Utah. He began his service with the company at the Arthur mill assay office, where he was successively chemist in the research department and a mill shift boss. He became general foreman of the Magna mill in 1945.

T. H. Cain has been made assistant superintendent of the Godfrey-Morris mine of Oliver Iron Mining Co., at Chisholm, Minn., and Carl R. Burton has been advanced to the post of assistant superintendent of maintenance for the district.

Arthur E. Bernard has succeeded the late Matt Murphy as Inspector of Mines for the State of Nevada.

H. G. Washburn has retired as general manager of operations for the Federal Mining & Smelting Co. and affiliated companies, at Wallace, Idaho, after serving 17 years. J. E. Berg, also of Wallace, assistant general manager, has assumed the post held by Mr. Washburn.

J. B. Haffner has been elected president of the Idaho Mining Association, at Wallace, Idaho, succeeding John D. Bradley. Mr. Haffner is manager of Bunker Hill & Sullivan Mining & Concentrating Co., and Mr. Bradley is vice president of Bradley Mining Co., at Stibnite, Idaho. **A. H. Shoemaker**, manager of Triumph mine, at Hailey, Idaho, was elected vice president of the association.

WALTER E. SCOTT, JR.

Walter E. Scott, Jr., is continuing his consulting office in Central City, Colo. He is consultant for the Terrible-Dunderberg and Mendota mines, at Silver Plume, the Rollins placer, near Central City, and the Joe Dandy mine, at Cripple Creek. **Harvey L. Tedrow**, his associate, is manager of the El Paso mine, Cripple Creek.

At the 193d annual commencement exercises of Columbia University, New York, **Dr. Frank D. Fackenthal**, acting president of the University, conferred the honorary degree of Doctor of Science on **Louis S. Cates**, president, Phelps Dodge Corporation, and **Harvey S. Mudd**, Pacific Coast mining engineer. **Albert H. Case**, vice president and general manager of General Phosphoric Products, New York, was awarded a University Medal for Excellence for his contribution to "the finding and development of Tennessee copper sulphite, thus adding to the country's industrial resources."

D. H. Angus, of Haileybury, Ont., was elected president of Consolidated Beattie Mines, Limited, Quebec, at a recent meeting of the directors of that company.

Percy W. Donovan has resigned as vice president and manager of the Contract Drilling Division of E. J. Longyear Company as of June 6, 1947, after completing 42 years of active service. He was elected to the board of directors in 1916 and will continue in this capacity for a time and, in addition, will serve as consulting engineer. Effective June 6, **Vincent N. Burnhart** will be manager of the Contract Drilling Division. Mr. Burnhart joined Longyear early in 1946 as assistant to Mr. Donovan.

Gonzalez Videal, President of Chile, and **Luis Bossay**, Minister of Economy, went to Copiapo on June 17 to inaugurate the Paipote Copper Smelter works.

John E. Bowenkamp has returned to Sullivan, Missouri, on a three months' leave of absence from South America, where he was engaged in mine examination and exploration work in Peru and other countries for Wellington Explorations, Ltd., a subsidiary for Latin America of the N. A. Timmins Corporation of Montreal, Canada.

Dr. R. R. Sayers, Director of the Bureau of Mines, has designated **Samuel A. Gustafson** as acting supervising engineer at Denver. He has been with the Bureau since 1940. Gustafson is a graduate of the Colorado School of Mines.

Donald H. McLaughlin, president of the Homestake Mining Co. of Lead, S. D., has accepted the chairmanship of the program committee for the 1947 Metal Mining Convention of the American Mining Congress, to be held at El Paso, Tex., Oct. 27-29. The convention is sponsored by the Western Division of the Mining Congress, headed by **H. M. Lavender**, vice president and general manager of Phelps Dodge Corporation, Douglas, Arizona.

Hugh Bein, geologist, has joined

STANDARD ENGINEERS NOTEBOOK

Standard Diesel Fuel lengthens injector life

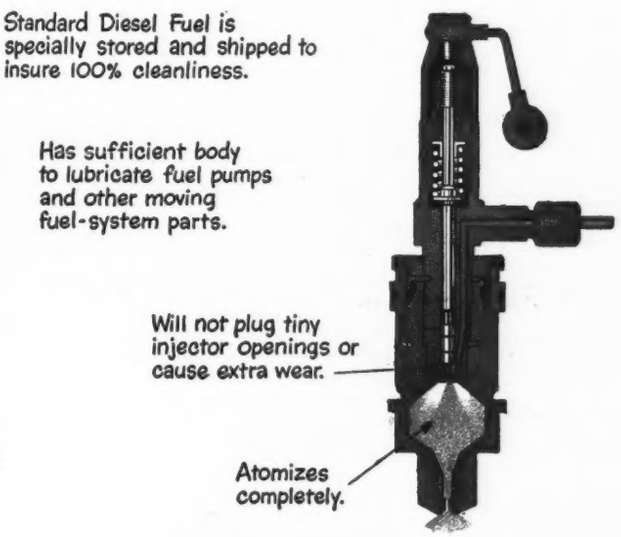
Many Diesel engine operators have minimized fuel system trouble and made parts last longer by the use of 100%-clean Standard Diesel Fuel.

This special fuel is manufactured from the finest crudes and is completely distilled. Numerous checks and rigid control during manufacture assure a uniform high-quality product with just the right body to lubricate all parts in engine fuel systems.

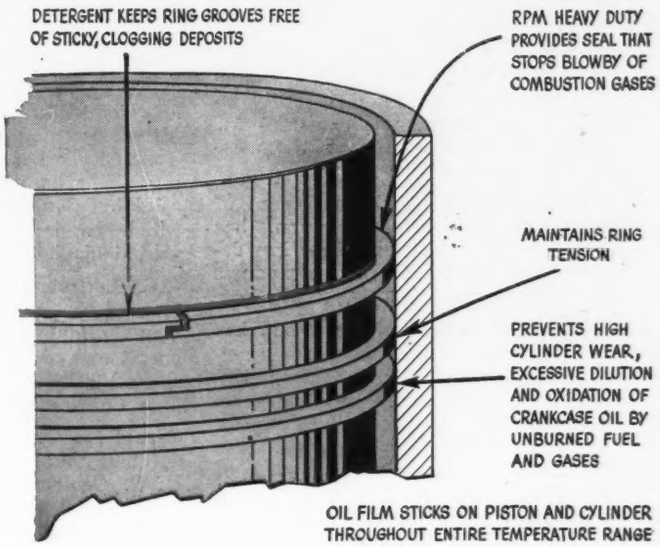
To prevent contamination, Standard Diesel Fuel is handled in separate pipelines, tankcars, trucks and containers. It comes free of grit and moisture, the principal causes of injection valve wear.

Standard Diesel Fuel flows freely and atomizes completely. It burns smoothly, producing maximum power in engines.

It is recommended for all Diesel engines except those requiring a special high-cetane fuel where Standard Locomotive Diesel Fuel and Standard Automotive Diesel Fuel are recommended.


Standard Diesel Fuel is specially stored and shipped to insure 100% cleanliness.
Has sufficient body to lubricate fuel pumps and other moving fuel-system parts.
Will not plug tiny injector openings or cause extra wear.
Atomizes completely.

Typical Injection Valve.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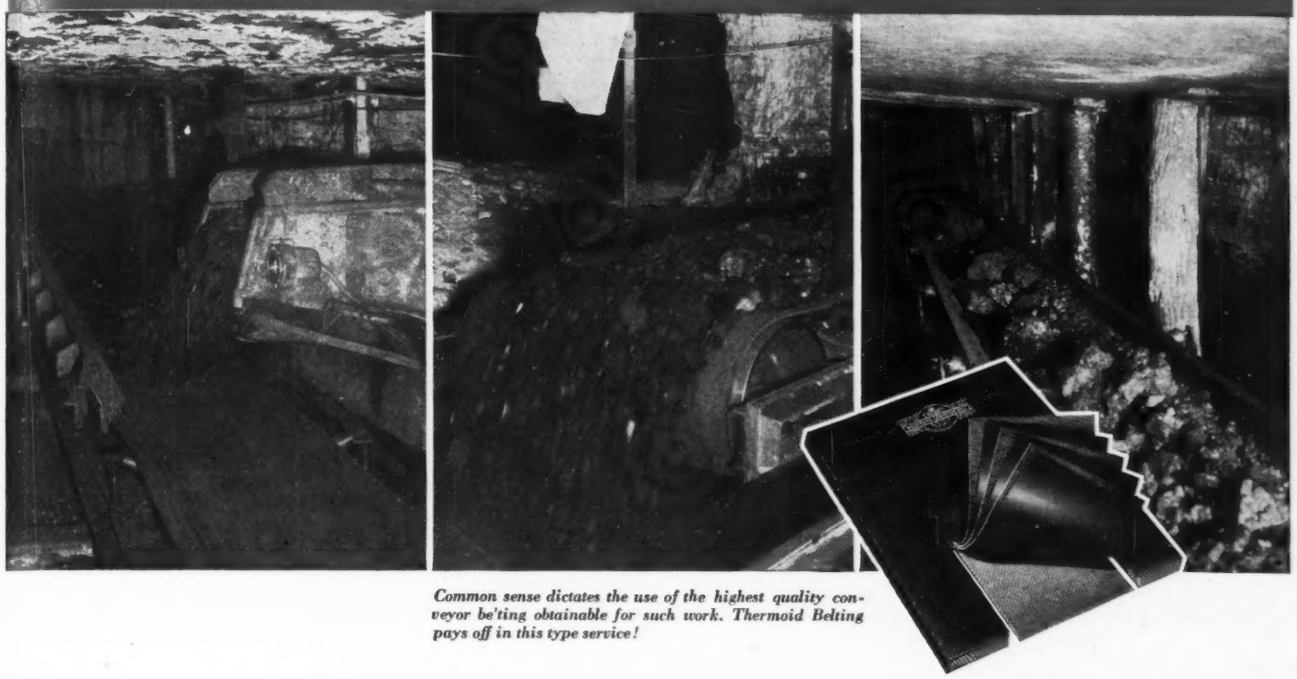

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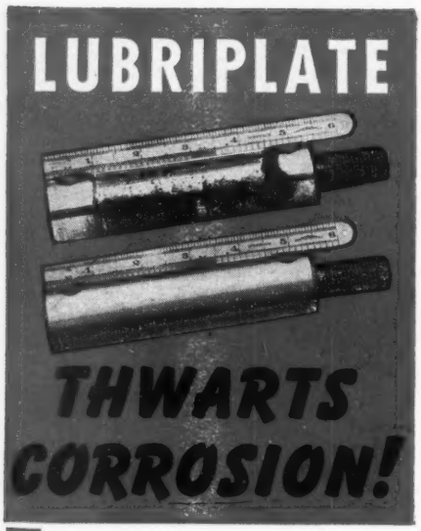
Thermoid Company, Trenton, N. J., U. S. A.

The Thermoid Line Includes: Industrial Brake Linings and Friction Products • Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Custom Molded Parts.



These originally identical shackle pins from a ten ton truck were used in a comparative lubrication test for a period of one year. A well known conventional lubricant was used on the upper pin. Note the pitting from corrosion, also the excessive wear. LUBRIPLATE was used on the lower pin. Its surface remained bright and true as when the test began, proof that LUBRIPLATE is different . . . better.

LUBRIPLATE

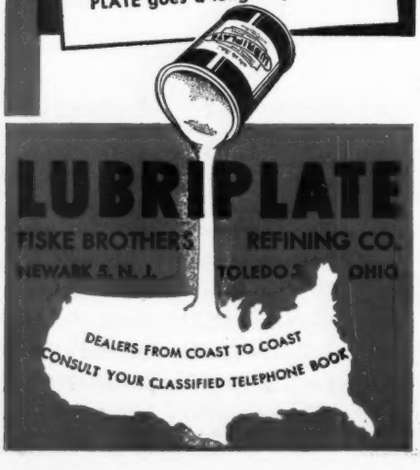
Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE

Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE

Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.


LUBRIPLATE
FISKE BROTHERS REFINING CO.
NEWARK 5, N. J. TOLEDO 2, OHIO
DEALERS FROM COAST TO COAST
CONSULT YOUR CLASSIFIED TELEPHONE BOOK

Atlas Mining Co., Mullan, Idaho, died June 3. During the war, Mr. Greenough served on the Metals Production Board in the lead, tin, and zinc division and as chairman of the Quota Committee which set up the Premium Price Plan for lead and zinc.

Juan Lepe, general manager in Chile of Campagnie Miniere du M'Zaita, owner of the Chagres Smelter, recently died suddenly. Senor Lepe, a distinguished Chilean mining engineer, worked for nearly 40 years with the above-mentioned company, and became general manager ten years ago.

LETTERS

A Card of Thanks From Africa

The Editor:

I have just completed a very extensive tour of mining fields in the United States, including in addition visits in Mexico and Canada. The object of my trip was to study at first hand modern mining methods and machinery, and to achieve this I visited some 48 mining and tunneling operations in 22 states. As in many cases I have not been able adequately to thank many of the persons who so willingly and kindly assisted me, I would like to express my appreciation here for all the attention, kindness, and courtesy shown me by mining men of all ranks in the industry, from presidents of big corporations to machine men and muckers. Through the help thus given I have gained much information which I feel will be invaluable not only to myself but also I hope to the mining industry in South Africa, where I normally work.

Further, too, I have been able to make many pleasant friendships throughout your great country, which will stay as pleasant memories throughout my life, and have taught me more than anything else could have done what America stands for.

V. W. A. DUKE

Johannesburg, South Africa

Cooperative Development of Mines in Spain

The Editor:

On my return to Spain from New York, I have kept the promise made to you at the Mining Club by gathering impressions here concerning the conditions under which American techniques and capital might cooperate in opening up Spanish lead deposits.

There seems nothing to prevent the formation of mixed American and Spanish mining companies that would be aimed at exploiting whole districts instead of single small mines. The districts of Sierra Almagrera, Sierra de Cartagena, Linares, and others might be revived in this way. In such a company Spain would be allowed a 50% participation and would have administrative control. The directorate would be equally divided between Spain and America. American contribution would be principally that of machinery and technique.

Of necessity, the direction of such enterprises that so vitally concern this country has to be entrusted to its citizens, but we think a convenient formula could be found to regulate that question. For example, the corporations to be formed might be supported by other companies now active in Spain that have American interests and with which satisfactory arrangements could be made.

Moreover, American participants, including contributors of technology, would enjoy preference in dividends, a part of which could be distributed first to foreign capital; a second part to Spanish capital, and the remainder apportioned between both. Guarantees could be given for transfer to America of a major part of such dividends, and it might even be possible to guarantee voluntary amortization, in time, of the adjudged participation.

In the Sierra Almagrera, several small mines are now joined together under direction of a Government branch of the *Instituto Nacional de la Industria.* The veins of this district have been worked in ancient times, but mining has been halted in recent years by political and economic disturbances. The old workings are now flooded, but there is still available much ore mining some 800 grams of silver to the ton. American techniques are required to reopen this district.

In Cartagena lead ore reserves run into 20,000,000 tons or so of good ore. I think sink-and-float or flotation would serve admirably here. Many of the mines belong to a French-Spanish company. In Linares are various mines that could conveniently be united for more efficient exploitation. (Ed. note. See *E.&M.J.* April 1947, p.94.)

I would ask you and your friends to consider these matters in principle. I can supply details of the present and past status of all the districts I mentioned if anyone would like to set up a mining company between the U.S.A. and Spain. I should be very glad if this were done, because such close collaboration would benefit both of our countries.

AGUSTIN MARIN.

(Communications may be addressed to Mr. Marin in care of the Editorial Department of E.&M.J.—Editor)

Sampling Early-Day Producers

The Editor:

When an engineer examines an old mining property which may have produced 30 or 40 years ago, he follows the usual procedure in carefully moil-

ing existing ore faces, calculating his samples as to value, and drawing the conclusion that ore in sight, based on the sampling program, contains certain percentages of metals and certain dollar values. The writer followed the foregoing procedure and gave credence to this method until recently, while opening the Elkhorn mine, in Jefferson County, Mont.

The Elkhorn mine was discovered in 1875, developed to the 2,350-ft. level on incline, and operated as a silver-lead producer up to nearly 40 years ago. The mine contains thousands of feet of workings, all of which were extended by single-jack, hand-drilling methods. Candles were used for lighting. The mine is said to have operated under mining and milling costs of $24.00 per ton. Old tailings, now being shipped daily, average about 6.0 oz. silver, 0.03 oz. gold, 1.7% lead, and 4.2% zinc per ton. The mine is again on a crude ore shipping basis, after some months of unwatering and development.

After the first ore faces encountered in the old stopes near the 500-ft. level were sampled, and ore shipments began, it was found that all ore assays, secured before drilling, were considerably below shipping returns. The reason for this, one that is not ordinarily recognized and understood, was that in the early days of hand-steel drilling the miners "pot-shotted" all immediately available high-grade ore, leaving remaining ore faces under abnormally impoverished conditions. For example, if 100 lb. of good silver-lead ore was in sight, which could be readily single-jacked, the miner of early days simply drilled a hole and blasted the high-grade spot. He "picked the eyes" wherever he could.

The following facts were determined about the early-day method of mining:

1. Little or no prospecting was done in foot- or hanging-wall territories, which later yielded new and important orebodies.

2. When ore grade dropped to 15 oz. silver per ton or less in a particular stope, mining was stopped.

3. Moiled samples in the old mine did not ordinarily reflect true ore values at particular locations nor indicate permanent impoverishment at specific points. One machine-drilled round of holes has actually shown ore improvement.

An obvious lesson for an engineer who is examining, sampling and reporting on any old mine property, having a history of important production, is to consider in his report: first, reason for discontinuance of former operations, such as a drop in metal prices; second, methods employed in early-day mining; third, discounting of low sampling results where sizeable ore stopes exist and where wide orebodies still remain open for inspection; fourth, importance of favorable attending geological features in evaluating the future of the property.

WADE V. LEWIS
Boulder, Mont.

Compressed air furnished by Schramm Air Compressors is evidenced today in mines throughout the country... offering you all the air you want no matter what the job is!

To make your mining easier, quicker, more economical, Schramm Compressors have these features: 1. 100% water cooled... 2. Push Button Starter... 3. Rugged construction to withstand any use... 4. Lightweight enough to be moved about anywhere in the mines.

For the many air jobs we have a complete line of Compressors. Write us today for fully illustrated booklets describing the features and advantages of each.

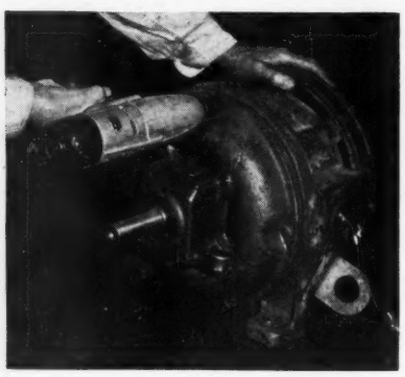
SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

EQUIPMENT NEWS

All-Purpose Earthmover

Combining the functions of dragline, clamshell, and crane, and retaining the utility of a bulldozer, the new Hystaway unit, manufactured by the Hyster Co., Portland, Oregon, is designed for use with D6 and D7 Caterpillar tractors. Utility use of the bulldozer is possible with the Hystaway installed as shown. Full production use of the bulldozer is possible one hour after beginning to dismantle the Hystaway attachment. The Hystaway transmission is left on the tractor.

As an example of the usefulness of the unit, the company cites a pipe line job, where the Hystaway draglines the ditch, then operates as a crane to lower the pipe, and backfills with the bucket or as a bulldozer.



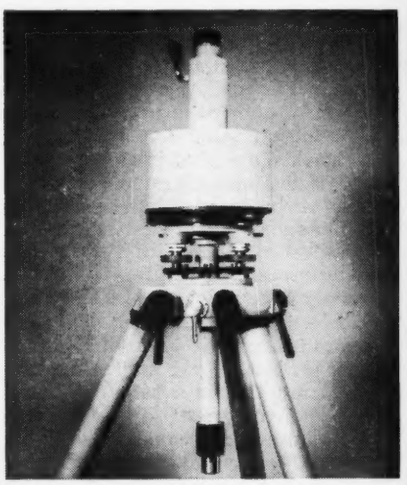
New Electric Impact Tool Serves Many Purposes

All manner of repair and maintenance jobs can be made easier and faster through use of a new universal electric impact tool just announced by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. The device makes use of somewhat the same principle as the company's well known air impact wrench, but it is powered by electricity.

The new impact tool, called the 4U, runs smoothly as any conventional electric tool until the resistance to spindle rotation reaches a certain amount. Then a patented mechanism converts the power of the motor into "rotary impacts" which exert a more powerful turning effort than is produced by any other electric tool of comparable size. Using standard attachments, the tool will apply and remove nuts, drill, ream, tap, drive and remove screws or studs and do many similar jobs.

The tool weighs only 6½ lb. and has an overall length of 10½ in. Its free speed is 2,000 rpm; it delivers 1,900 rotary impacts per minute under load. It is powered with a reversible 3-amp. motor that operates on 110-v., a.c. or d.c. current. The machine is so designed that the spindle may be stalled completely under overload without injuring the motor, which will merely continue to run.

The unit is suitable for: cap screws up to No. 20; drilling brick and mametal up to ¼-in.; reaming to ½-in.; tapping from ¼ to ½-in.; machine screws up to ⅝-in., and wood screws up to No. 20; drilling brick and masonry with carbide-tipped tools up to ⅝-in. size. The photographs show the tool in use to tighten nuts on a motor bell and to ream holes in an angle bracket.



Vertical Magnetometer

Light weight, ruggedness, and ease of adjustment in the field, are said by the manufacturer to feature the new vertical reconnaisance magnetometer announced recently by the Robertson Co., 5022 Ennis St., Houston 4, Texas. Careful design and selection of materials have reduced weight of the tripod, compass, and instrument to about 12½ lb.

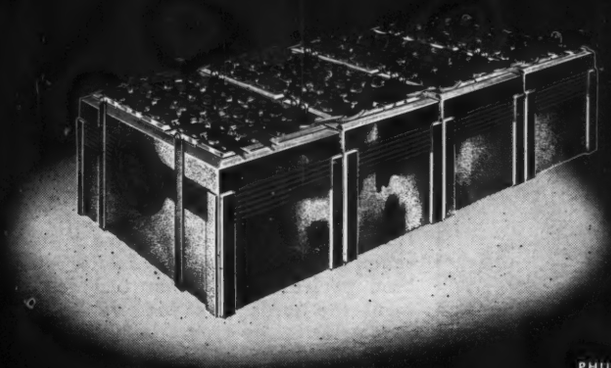
Levels and thermometer are read from the top of the well-insulated case. The system used is a modified temperature-compensated Askania type, and the sensitivity may be adjusted from 20 to 100 gammas per scale division. For further details, a request may be sent to the manufacturer.

Medium-Sized Dirt-Mover

A medium-sized version of the Payloader shovel, used for handling concentrates or other bulk materials, has been announced by Frank G. Hough Co., Libertyville, Ill. The new Payloader, Model HF, has a ¾-cu. yd. shovel, but a bulldozer blade, a crane hook, a cab, or a snow bucket can be

Built for hard work—All day—Everyday

Only operators of ***battery powered*** *haulage equipment know how dependable, trouble-proof and safe underground haulage can be. Only those who have tried the toughest battery of them all—the Philco "Thirty"—know how much more work a really modern, extra capacity mine battery can do . . . and how much money it saves. Ask a Philco man for the facts. Write for specification data.*



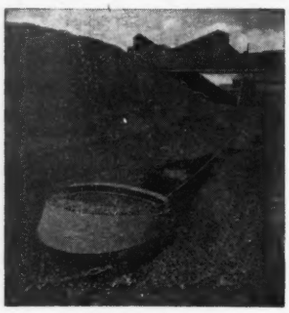
PHILCO

STORAGE BATTERIES

PHILCO CORPORATION • STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY

SLASH COSTS
with Sauerman Machines

Above Sauerman Scraper is digging placer gravel.



Here's a Sauerman Scraper handling huge stockpile of tailing.

AT mills, smelters, open pits, strip mines—wherever there are problems of stockpiling or excavating — Sauerman Crescent Scrapers daily demonstrate their ability to dig and deliver large tonnages at costs of a few cents a ton.

The secret of "Crescent" efficiency is in the streamline design of this unique bucket. A Crescent scraper penetrates like a plowshare, and requires less line-pull than any other type of scraper.

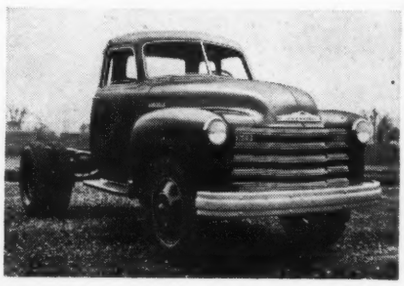
Moving back and forth at an average speed of 400 f.p.m., loading and dumping automatically, a Crescent Scraper, operated by a Sauerman improved hoist, is the most productive one-man machine for handling materials.

Write for CATALOG

SAUERMAN BROS., Inc.
584 S. Clinton St., Chicago

Unique Advantages
in Canada's Famous
BBS-2 SURFACE DIAMOND DRILL
Here is the world's most versatile surface diamond drill. Its rugged construction and high speed motor have been thoroughly tested under every possible operating condition. Newly developed combination gear and friction feed swivelhead permits greatly improved control. Other interchangeable swivelheads provide screw, hydraulic or friction feed suitable for every formation. Model BBS-2 drills a wide range of diameters—handles rods, casings, pipes in various combinations—can be equipped with auxiliary hoist for baling. Its capacity: 2000 feet with "E" rods—1800 feet with "A" rods.
Write for bulletins describing our complete range of field-tested underground and surface drills and Ready-Set cast bits. Special care assumed in handling and shipping all export orders.
WE LOOK INTO THE EARTH
BOYLES BROS. DRILLING CO. LTD.
DIAMOND DRILLING CONTRACTORS AND MANUFACTURERS
VANCOUVER B.C. EDMONTON, ALTA. PORT ARTHUR, ONT. KIRKLAND LAKE, ONT. YELLOWKNIFE, N.W.T.

used instead if desired. One feature of the new model is of particular interest. Once a desired gear ratio has been selected by the single gear shift lever, the operator can move forward or reverse by simply flipping a directional lever. Numerous other automatic or controlled features of the new machine are fully described in the company's Bulletin No. 166.



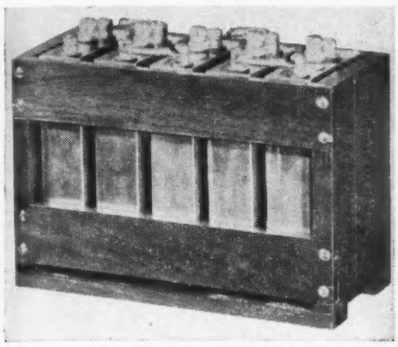
New Trucks Announced

Numerous mechanical improvements and certain features that increase driver comfort and safety are incorporated in the new line of trucks and commercial cars recently announced by Chevrolet Motor Division of General Motors Corporation. Gross vehicle weights of the new trucks range from 4,000 to 16,000 lb. Bodies in general have been widened and various frame members have been made heavier. Two engine sizes are available. Cabs are all-welded, are roomier, and have a new ventilation system that minimizes windshield fogging. A wide variety of models is available on nine wheelbases. The model shown is a heavy-duty type with a pay-load capacity of 5 tons.

Cadmium-Nickel Battery

Said to combine the advantages of lead-acid and nickel-iron-alkaline storage batteries, a cadmium-nickel alkaline storage battery is now being manufactured in this country by Baker & Co., Inc., Newark 5, N. J. Used in Europe for the past 20 years, the cadmium-nickel battery is said to have been perfected by Baker technicians to fit the needs of a wide variety of industries.

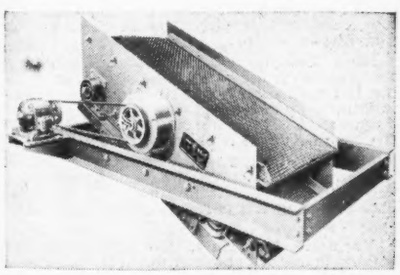
The Baker battery accepts high or low charge rates with no finish rate limitations, and it is said to have excellent capacity at low electrolyte temperature with no danger of freezing damage. It has a minimum spread between charge and discharge voltages, and is said to be ideal for floating service applications. The battery has low internal resistance and will not self-discharge on open circuits.



Sturdily constructed of nickel-plated steel, the battery's active material is held firmly in perforated steel pockets to prevent shedding. There are no fumes given off that would corrode steel or wood.

Concentric-Action Screen

A new vibrating screen, to be known as the Link-Belt "CA" concentric-action screen, has been announced by Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill. The screen can be used for both medium and heavy-duty sizing, as well as for scalping and



dewatering or rinsing operations. It is made with double or triple decks in sizes ranging from 3x8 ft. to 6x14 ft. Single deck screening is provided by removing the lower deck of the double-deck screen.

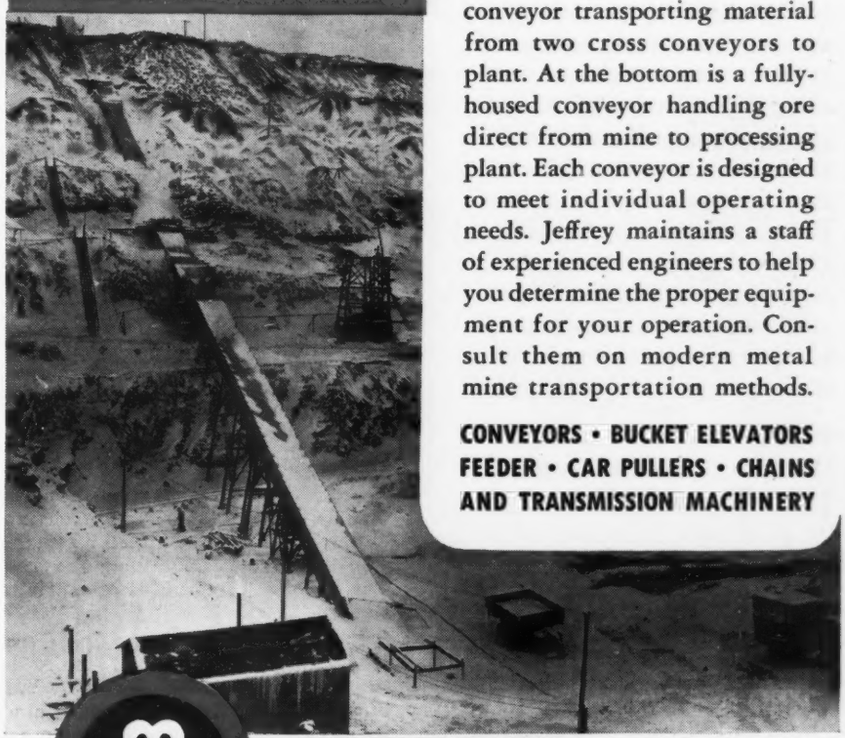
Advantages cited by the manufacturer are: high capacity, owing to great amplitude and true circle of vibrating movement; and unobstructed screening surface; smooth operation; and low maintenance. The unit shown is floor-mounted, but the screen can also be spring-and-cable mounted if desired. Details are given in the Link-Belt Book No. 2154, available on request.

Special Magnetic Separator

Originally designed to remove magnetic materials from Exolon abrasive

JEFFREY Conveyors

PROVIDE CONTINUOUS COAL AND METAL MINE TRANSPORTATION



Jeffrey Conveyors are designed and developed to meet specific operating conditions. For example at the top we show a belt conveyor transporting material from two cross conveyors to plant. At the bottom is a fully-housed conveyor handling ore direct from mine to processing plant. Each conveyor is designed to meet individual operating needs. Jeffrey maintains a staff of experienced engineers to help you determine the proper equipment for your operation. Consult them on modern metal mine transportation methods.

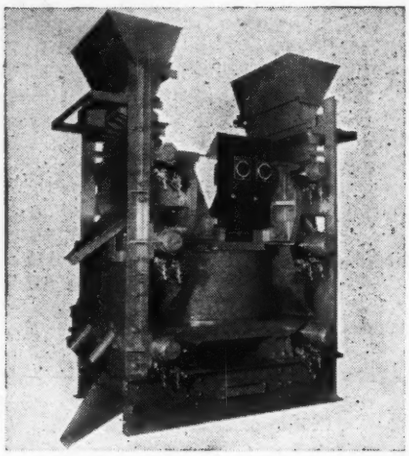
CONVEYORS • BUCKET ELEVATORS
FEEDER • CAR PULLERS • CHAINS
AND TRANSMISSION MACHINERY

JEFFREY ....ESTABLISHED 1877

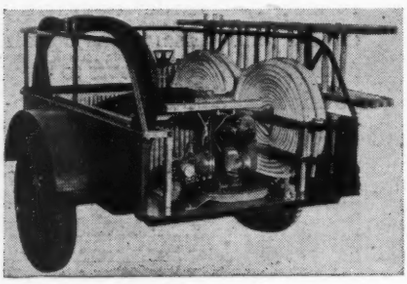
THE JEFFREY MANUFACTURING COMPANY
974-99 North Fourth Street, Columbus 16, Ohio

Baltimore 1	Chicago 1	Detroit 13	Jacksonville	Pittsburgh 22
Birmingham 3	Cincinnati 2	Harlan	Milwaukee 2	St. Louis 3
Boston 16	Cleveland 13	Houston 5	New York 7	Scranton 3
Buffalo 2	Denver 2	Huntington 19	Philadelphia 9	Salt Lake City 1

grains, a special high-intensity magnetic separator developed by the Exolon Co., 946 East Niagara St., Tonawanda, N. Y., has been found useful in concentrating various weakly-magnetic substances.



The material in dry granular form falls on a magnetized rotor, which alters the trajectory of any magnetic material leaving it. A knife edge is set in the stream of material to make the best separation. By passing over a series of such rotors, in which field strength increases, all magnetic material is finally caught. The standard double machine provides four such separations on each side. Capacity is of the order of two to four tons per hour. Full details will be supplied by the manufacturer.



Fire-Fighting Unit

Low-cost fire protection for mining camps is available in the form of the Porto-Pumper, a pumping and fire-fighting unit made by Porto-Pump, Inc., 227 Iron St., Detroit 7, Mich. Mounted on a two-wheeled trailer, the unit includes: a gasoline-driven pump, 75 ft. of supply hose, 250 ft. of fire hose, an 18-ft. 3-section extension ladder, a fire axe, and a hand-type extinguisher. Cost is estimated at about one-sixth that of the lowest-priced fire-fighting, pumping unit on the market.

INDUSTRIAL NOTES

Goodall Rubber Co., Inc., announces the opening of an affiliated company, **Goodall Rubber Co., of Minnesota,** formerly the Minnesota Rubber & Supply Co., at 2482 University Ave., St. Paul, Minn. **Leonard Berg** is vice-president and branch manager.

Macwhyte Co., Kenosha, Wis., has elected **Robert P. Tyler,** formerly general sales manager, as vice-president in charge of sales.

A. H. Jones, formerly West Coast manager at Los Angeles for **Gardner-Denver Co.,** has been appointed director of the company's export office in New York and has been elected vice-president of the newly-formed **Gardner-Denver Western Hemisphere Co.,** with offices in New York.

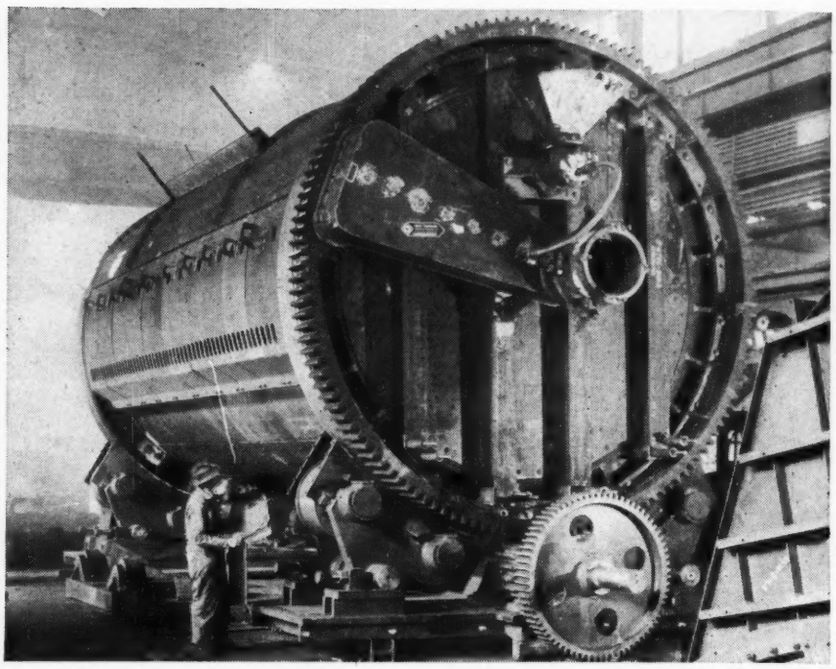
William A. Anderson retired on May 1 after over 49 years' service as an explosives salesman, since 1921 with Hercules Powder Co.

Bruce Shotton, manager of **Hendrick Mfg. Co.'s.** Pittsburgh branch and chairman of the manufacturers' division of the American Mining Congress, was killed in an accident at Marietta, Ohio, on April 10.

Euclid Road Machinery Co., Cleveland, Ohio, has established a sales development department, headed by **V. L. Snow,** to make field engineering studies of current Euclid models and possible new equipment.

Edmond C. Bitzer has been appointed general manager of the **Colorado Iron Works Co.,** Denver, Colo. Mr. Bitzer has been with the company since 1941 as sales manager and metallurgical counsel.

Robert P. Nichols has been appointed assistant domestic sales manager for **R. G. LeTourneau, Inc.,** Peoria, Ill.



A COPPER CONVERTER, one of two 13x30-ft. Peirce-Smith units now being made by Allis-Chalmers Mfg. Co., Milwaukee, Wis., for the Boliden Copper Co., Skelleftea, Sweden. Riding rings at the ends of the shell permit the use of four more tuyeres than formerly. End heads are spring-mounted to allow expansion of the brick lining.

BULLETINS

V-Belts. A new catalog describing features of Veelos adjustable V-belts, how to couple and uncouple, measure, and install them, has been prepared by Manheim Mfg. & Belting Co., Manheim, Pa. Application photos are given.

Conveyor Belts. A new 4-page catalog section on its line of conveyor belts, featuring selection of grades for specific services, has been prepared by B. F. Goodrich Co., Akron, Ohio.

Mine Telephones. A folder describing the Femco trolley-phone system for talking between dispatcher and haulage crews in mines is described in a new folder of Farmers Engineering and Mfg. Co., 549 Brushton Ave., Pittsburgh 21, Pa.

Flexible Couplings. Thomas Flexible Coupling Co., Warren, Pa., has prepared a new bulletin describing the DBZ flexible-disk coupling for correcting for shaft misalignment.

Magnetic Materials. To help engineers and fabricators pick the best magnetic materials for their purposes, Allegheny Ludlum Steel Corporation, Brackenridge, Pa., has prepared a 32-page bulletin on core materials.

Dredge Buckets. Full details on Tisco rivetless buckets for gold, tin, and platinum dredges, including latest improvements, are contained in a new folder just issued by Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

Air Cleaner. The new Aridifier bulletin No. 147, issued by Logan Engineering Co., 4901 Lawrence Ave., Chicago, Ill., points out various features of design and installation of the company's method of removing dirt, water, and oil from compressed air lines.

Plastic Fire Brick. Laclede-Christy Clay Products Co., St. Louis, Mo., has prepared a colorful and complete description of the possibilities of plastic fire brick in furnace construction.

Mine Fans. A catalog illustrating and describing the complete line of Jeffrey mine ventilating equipment to meet every mining condition is now available from Jeffrey Mfg. Co., Columbus, 16, Ohio.

Sand Pumps. Allen-Sherman-Hoff Co., 229 South 15th St., Philadelphia, Pa., announces a new catalog, No. 547, describing the company's Hydroseal pumps for sand, slurries, dredge service, and similar work. Complete data are furnished.

Geiger-Mueller Counters

(*Continued from page* 95)

out that these radioactive substances could easily concentrate in faults and fissures, and that the degree of concentration could roughly indicate the nearness to the deposit. Counter tubes in diamond-drill holes or other mine openings could be used to aid in these explorations.

4. To locate pegmatite dikes, and differentiate between rocks with varying radioactive qualities, such as shales and limestones.

Miscellaneous Applications.

1. It has been found that radioactive minerals tend to associate with other heavy minerals. Thus, even though not in sufficient quantity to warrant extraction, the radioactive minerals can help to locate other valuable minerals.

2. Ultraviolet ray lamps help to identify scheelite in orebodies and mineral specimens and to determine concentrations in mill tails and heads. In an analogous way, Geiger tubes can be used to run quick "assays" of radioactive mill products and ore samples, and aid in mineral identification.

3. One geophysicist has suggested a technique involving measurement of the alpha radiation of diamond-drill cores with laboratory equipment. He suggested that by comparing the relative intensity of radiation of various samples, it would be possible to determine the proximity to certain orebodies.

4. Designers of Geiger equipment have pointed out that with properly standardized techniques, it may be possible to scan faces of ore with portable equipment and to determine the grade of ore.

5. Tracers are used in industrial chemical processes to determine concentration and flow of certain products. It has been suggested that radioactive tracers could be used similarly in mill and metallurgical flowsheets, with Geiger counters to check performance.

E.&M.J. expresses its thanks to the following for information used in the preparation of this article:

J. S. Buhler and C. J. Woods of North American Philips Company, Inc., 100 East 42 St., New York.

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D. R. Tibbetts, Cyclotron Specialists Co., Moraga, California.

Richard Murphy, director of exploration, Eldorado Mining and Refining (1944), Ltd., Ottawa.

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REGIONAL NEWS

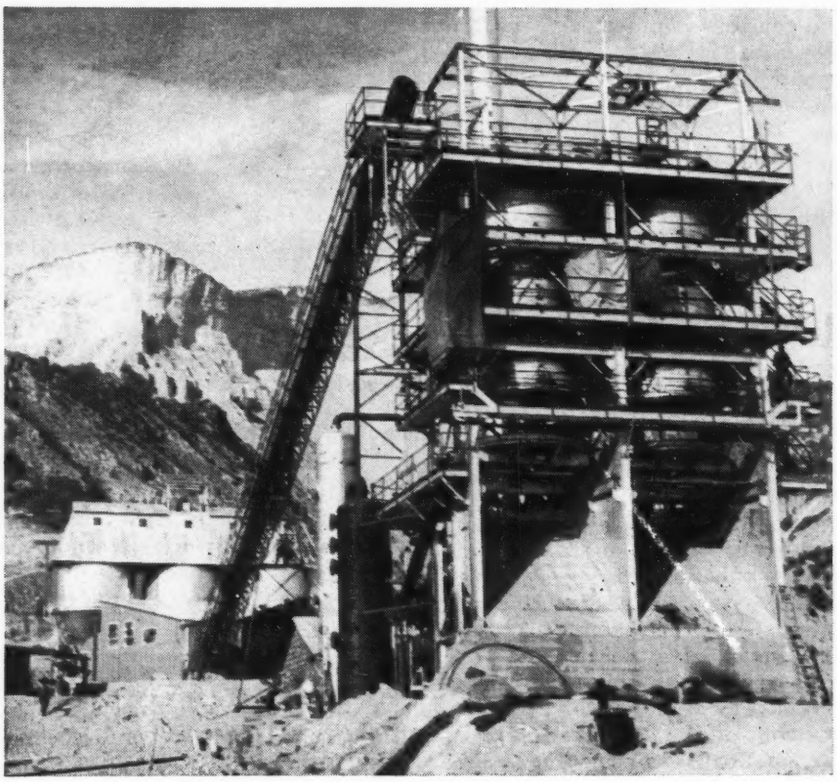
COLORADO

Increased activity reported at Idaho Springs — Bureau of Mines oil shale plant dedicated

★ Dedication ceremonies for the oil-shale demonstration plant of the U. S. Bureau of Mines at Rifle were held on May 17. A large group of industry representatives and public officials was present. Speakers included Oscar L. Chapman, under-secretary of the Department of the Interior; Commodore William G. Greenman, director of the U. S. Naval Petroleum Reserves; Dr. R. R. Sayers, director of the Bureau of Mines; and F. C. Merriell, secretary of the Colorado River Water Conservation District. Boyd Guthrie, supervising engineer of the new plant, officiated. The plant is situated nearly 3,000 ft. below the almost vertical cliffs from which the shale is mined. Under the 44,500 acres in U. S. Navy Oil Reserve No. 1, on which the Rifle plant will draw, the Navy estimates a potential of 15 billion barrels of oil. The plant is designed to demonstrate that crude oil may be commercially produced from shale for refining into low-cost oils and gasoline. A 70-ft. flat vein will be mined in three benches, about 1,500 tons of shale being blasted on each bench with a single shot. The shale is loaded from chutes into diesel trucks operating in two tunnels. It is believed that costs approximating 50¢ per ton of shale mined can be achieved. Entryways are now about 125 ft. deep into the richest part of the shale.

The extraction process operates through a combination of high pressure and heat, modeled in reverse of the natural process under which the oil was compressed into the shale during upheavals of the earth millions of years ago. The oil-shale measures of Colorado extend over more than 2,000 square miles, with a thickness of at least 500 ft. Estimates of the total potential yield range from 75 to 90 billion barrels. Naval Oil Shale Reserves No. 1 and No. 3 comprise about 60 square miles of the oil-shale formation, together with additional land adjacent to the oil-shale outcrops at the eastern end of the main Colorado deposits. The shale richest in kerogen on Reserve No. 1 usually is found near the top of a high escarpment, and outcrops in long lines of bold cliffs.

The demonstration plant was built with funds authorized by the Congress which appropriated $30,000,000 for the investigation of all methods of producing synthetic liquid fuels from coal, oil shale, and agricultural and forestry products. Preliminary runs of the retorting equipment have indicated that it will function satisfactorily. Contracts have been let for the refining facilities that are to be added to this plant, and the installation is expected to be complete by the end of 1947.



N-T-U RETORTS at the oil shale demonstration plant of the U. S. Bureau of Mines, near Rifle, Colo., are shown with the sheer cliffs of oil-bearing shale dominating the skyline. A conveyor links the shale storage bins to the retorts. The plant was formally dedicated on May 17. U. S. Bureau of Mines photo.

★ The annual report of Golden Cycle Corporation says that company and lessee operations at its Ajax mine, at Cripple Creek, in 1946 produced and shipped a total of 20,303 tons of ore, with a gross value of $432,297 and an average per ton value of $21.29. Development work during the year amounted to 3,413 ft.

★ Jack Downs, of the Lexington Co., reports one of the best ore discoveries in recent years at the Lexington property, near Idaho Springs. An assay made on a 20-lb. chunk of the ore shows 5.30 oz. gold, 32.50 oz. silver, and 20.54% copper to the ton. Downs says that two veins came together and now show a width of 14 in. of solid ore.

★ Rico Argentine Mining Co., with main office at 132 Main St., Salt Lake City, Utah, has issued a report covering operation of its property at Rico, Colo. during 1946. Gross value of ore produced was $1,012,124. Operating expenses totaled $690,533. Net profit before depreciation amounted to $220,676.

★ Callahan Zinc-Lead Co., Inc., has been operating the Akron property, at Whitepine, Gunnison County, under lease and option, with J. E. Dunn as superintendent. Development includes retimbering of the main tunnel and driving raises to upper levels of the Erie and North Star, which will be worked through the Akron tunnel. The ore is lead, zinc, and silver from a 7-ft. vein. The company is also unwatering the shaft and 500-ft. drift on a property at Alma consisting of 20 claims in the Weber group and 30 Alma Syndicate claims. The property is controlled by Norton P. Otis, of Denver, and is said to contain a large, undeveloped body of lead ore.

★ Development of a group of five claims about four miles northwest of Idaho Springs, adjoining the old Freeland mine, has been resumed by Royal Ann Mines, Inc., according to Dr. William H. Biles, Jr. of Denver, president.

Several hundred feet of tunnel driven during 1946 cut four strongly mineralized veins paralleling the Freeland main vein or coming in from the Freeland ground.

★ Joe Ruth has recently resumed work in the Gold Medal tunnel, near Idaho Springs. He is developing ore on the Freeman vein on a crosscut from the Gold Medal tunnel. The Dixie mine, a gold producer, has recently taken over exclusive use of the Silver Spruce mill, just outside Idaho Springs.

★ Bristol Mining Co., B. F. Williams, of Denver, president, has leased and optioned its property, situated at the foot of Mt. Loveland, near Alma, to a group of Eastern men who plan to organize a company and test the property for zinc-bearing ore. During the war, the Buckskin Joe, Red Cross, and Orphan Boy mines produced zinc ore from this area.

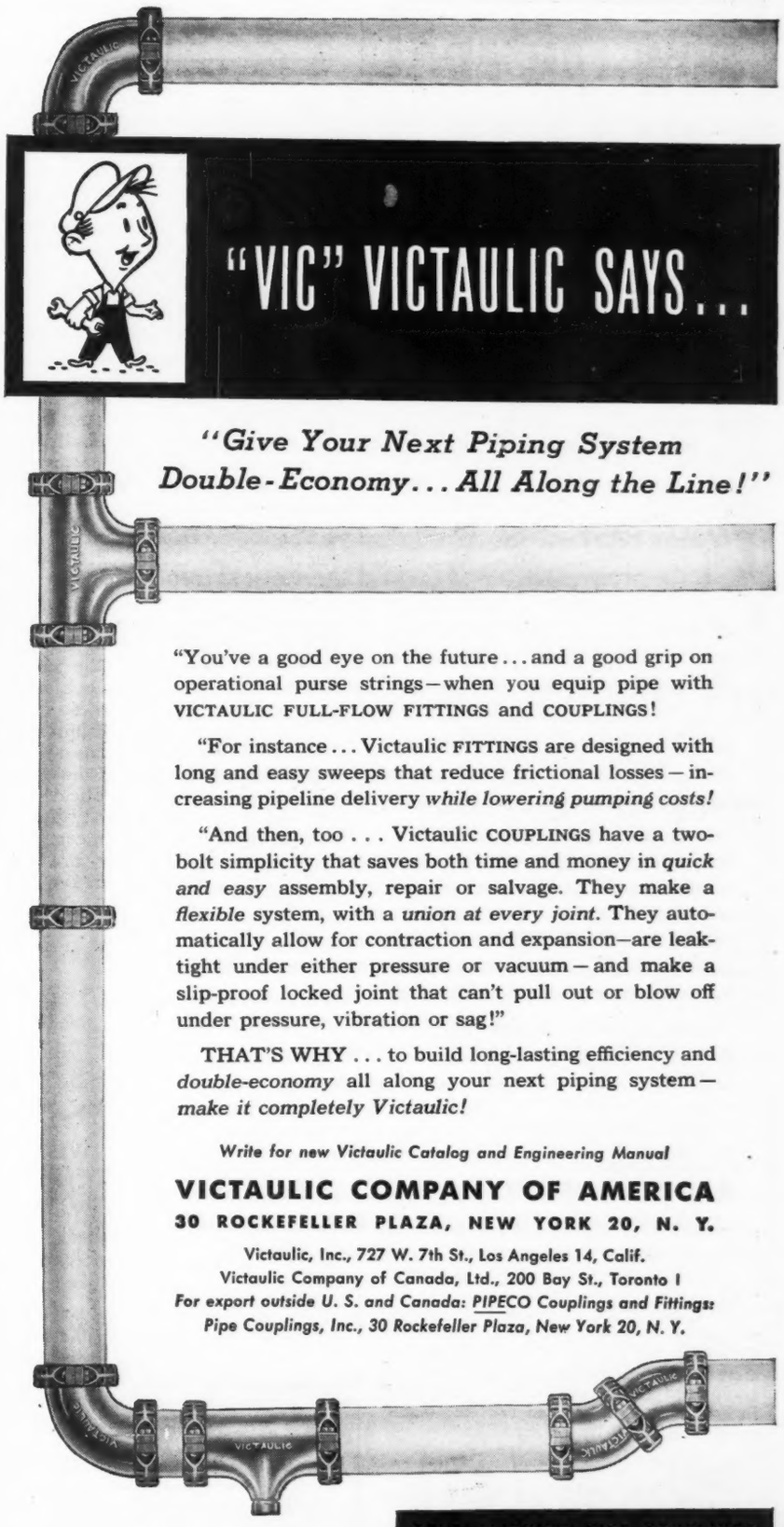
★ Highland Mary Mining Co., Inc., at Silverton, resumed work recently after the county road crew had cleared the road from the Pride of the West workings to the mill. It is expected that the company will soon start shipping concentrates. The property closes during the winter months because of unusually heavy snow conditions at the head of Cunningham Gulch. Between 35 and 50 men will probably be employed at the operation.

★ Receipts of gold at the Denver mint in April totaled 43,685 oz., valued at $1,518,992. In April 1946 the total was 40,487 oz., worth $1,417,043. Silver receipts were 16,824 oz., worth $14,567, compared with 9,548 oz., worth $6,782, in April 1946.

★ Colorado Fluorspar, Inc., at Brown's Canyon, near Salida, has completed construction of a large tailing dam built from some 15,000 yd. of compacted earth fill across the mouth of Three Mile Creek, which had been previously diverted. This will afford the impounding of tailings for the company's mill for the next five years. The work at the mine is under the direct supervision of Roy Hickman, of Salida.

★ Golden Cycle Corporation reports that water has continued to flow from the 32,927-ft. Carlton drainage tunnel, at Cripple Creek, at the rate of approximately 4,000 g.p.m. All ore produced by the Ajax mine during 1946 came from areas below the old water level drained by the tunnel.

★ John R. Austin Construction Co., associated with Colorado Contractors Co., is moving equipment into Clear Creek Canyon to push work on the new road to mines of Clear Creek and Gilpin counties, and for the purpose of enlarging the 900-ft. pioneer tunnel for this highway. The work will include 3,700 ft. up the creek from the pioneer tunnel and 1,500 ft. down the creek from the east portal. The drilling will be done from a jumbo mounting eight drills, and progress is expected to average ten feet a day.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UTAH

Last of potash lands restored to public domain — Union asks 25c. an hour wage increase

★ Plans for disposal of the Kalunite, Inc., plant south of Salt Lake City still were in doubt in June after Emerald Mining Co., Elko, Nev., the high bidder at $920,000, had failed to make a down payment of $184,000 as agreed. War Assets Administration officials said steps would be taken to induce the two other bidders for the plant to increase their offers. Otherwise the property is to be readvertised for sale. The plant was built in 1942 at a cost of $5,600,000 for production of alumina from ores mined near Marysvale, Utah.

★ The U. S. Department of the Interior on May 21 revoked the withdrawal of 200,000 acres of potash and magnesium lands in east central Utah which had been put in effect by former Secretary Harold L. Ickes. The lands were returned to the public domain, where they become subject to filings under the leasing act.

The order of cancellation restores all permits or applications that were rejected solely because of the existence of the withdrawal; applications for permits that were rejected for other causes, such as failure to comply with requirements of the law, are not affected and such applicants will have to make new filings.

The order freed all that remained of the original 3,000,000 acres withdrawn in 1945.

★ All contracts of Utah and Nevada unions of the International Union of Mine, Mill and Smelter Workers, CIO, have been reopened for consideration of wage rates, Willard Morris, union counsel, announced May 29. Contracts signed July 1, 1946, were scheduled to run until July 1, 1948, Morris said, but the union reserved the right to reopen them for consideration of wage rates. No deadline for completion of negotiations was set. The unions are asking a wage increase of 25¢ an hour.

★ A fact-finding board appointed by President Truman conducted hearings the last week in May in Salt Lake City on the dispute between Kennecott Copper Corporation and railroad brotherhoods over the future status of Bingham & Garfield Railway Co. employees (*E.&M.J.*, June, p. 124). The action followed rejection by both sides of an offer to mediate their differences.

Members of the fact-finding board are Judge H. Nathan Swain, of Indiana; Judge George E. Bushnell, of Michigan; and Joseph L. Miller, of Washington, D. C. Unions are barred by law from striking until 30 days after the board reports.

★ Western Gypsum Co. is spending approximately $1,000,000 on a new plant near Sigurd. Jacobsen Construction Co., contractor, is building the plant, which will produce plaster and gypsum construction board, according to Sid H. Eliason, company president. Production already is under way in the old plant of the American Keane Cement & Plaster Co., which has been thoroughly modernized.

United States Gypsum Co. recently authorized construction of a similar plant to utilize 920 acres of gypsum deposits, also located near Sigurd, which were purchased in 1936.

★ Silver King Coalition Mines Co., of Park City, reported a net loss of $57,900 for the quarter ended March 31, after all taxes and depreciation but before depletion estimates. Net loss for the year ended March 31 was $136,324.

★ Production of Tintic Standard Mining Co., at Dividend, declined from 40,880 tons of ore in 1945 to 12,079 tons in 1946, largely because of smelter strikes which kept the mine idle for nearly six months, James W. Wade, president and general manager, reported. Operating and administrative losses totaling $169,896 were offset by sales of securities for $187,909, resulting in net income of $18,012, compared with a net loss of $26,012 in 1945.

★ Tintic Standard Mining Co. and Eureka Lilly Consolidated Mining Co. filed suits on May 23 in the Fourth Utah District Court against Utah County, charging illegal tax assessments based in part upon federal subsidies received by the two companies.

★ Vanadium Corporation of America submitted the high bid of $85,000 for the surplus vanadium oxide plant at Monticello, including 75 acres of land, 17 buildings, and production machinery and equipment, which it operated during the war.

MONTANA

Forest Rose diamond drilling finds wide ore — Properties in Madison County taken over

★ Forest Rose Mining Syndicate, operating the Forest Rose mine, in the Dunkelberg district, Granite County, reports that a large orebody has been found by diamond drilling, the drill passing through a mineralized zone 50 ft. wide, of which 20 ft. is ore. The property was one of the largest producers of lead and zinc in Montana during the war and was shut down last spring to develop further reserves. The syndicate is owned by Ed. Hughes, of Jens; James L. Leonard, Spokane, Wash.; and William and Carl Jensen, both of Seattle, Wash.

★ Officers and directors of Green Mountain Mining Co. were reelected at the annual meeting of stockholders and Earl F. Elstone, of Missoula, was

reappointed general manager, with John B. Hopkins, superintendent. The company is operating a group of claims near Dixon, Sanders County. The ore contains copper, silver, gold and recoverable platinum. Ore shipments have grossed more than $200,000 since recent operations started. The shaft has been completed to the No. 3 level, where a station is now being cut.

★ The regular annual meeting of stockholders of Anaconda Copper Mining Co. was held at the office of the company at Anaconda on May 21, E. S. McGlone, of Butte, vice president in charge of Western operations, presiding. Maurice Newton, of New York City; William D. Thornton, of New York City; and Clark S. Judd, of Waterbury, Conn., were reelected to serve as directors for three years.

★ In the Melrose district, Madison County, J. F. Hatch, of Spokane, Wash., has leased the Melrose, Jack Rabbit, and some of the claims of Commonwealth Lead Mining Co., of Salt Lake City. It is reported that Hatch expects to drive a tunnel to tap lead, silver, and gold ore found near the surface.

★ James C. Roberts and Frank Kelly, of Spokane, Wash., have taken over the McKay placer ground in Bivins Gulch, northwest of Virginia City, Madison County. The ground formerly belonged to the Swayze estate.

IDAHO

Day interests join A. S. & R. in Vulcan shaft project — Silver Dollar resumes shaft sinking

★ Fern Mining Co., controlled by the Day interests, is reported to have joined American Smelting & Refining Co. in sinking the Vulcan shaft to a depth of 3,000 ft. to prospect an area of the silver belt. The Fern company holdings are south and west of the Vulcan property and can be reached by crosscutting from the Vulcan shaft, which A. S. & R. is now widening to 4-compartment size from the 800 level up. The work is under the supervision of Federal Mining & Smelting Co. The Vulcan property is owned by Callahan Zinc-Lead Co. and is under lease to A.S.&R. for a 60-year period.

★ Lookout Mountain Mining Co. has entered into a contract with Sunset Minerals Co., Pine Creek, which provides for the driving of a cross cut into Lookout Mountain ground from the Sunset 974-ft. level.

★ Ore mined from drifting operations on the Yankee Girl vein on the 3,100 level of the Sunshine mine netted Sunshine Consolidated Mining Co. $11,169.93 for the first quarter of 1947, according to the company's official report. The development is parallel to and approximately 1,000 ft. south of

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Idaho *(Continued)*

Sunshine vein, and is being operated by Sunshine on a 50-50 ownership basis. During March 335 tons were produced and milled, with mill heads assaying 43.05 oz. silver per ton.

★ Silver Dollar Mining Co. announces resumption of shaft-sinking operations from the 2,400 to the 2,700 level. The work was suspended on the 2,400 level because of inadequate hoisting equipment. A larger hoist has now been installed.

★ Nevada-Stewart Mining Co., in the Pine Creek area, is producing zinc-lead ore at the rate of 500 tons a month, which is being custom-milled at the Highland-Surprise mill, according to A. J. Reinhart, a director in both companies. The company is driving a development drift on an orebody of good milling grade which Reinhart reports as being 8 to 12 ft. wide.

★ Hecla Mining Co. has declared a quarterly dividend of 25c. a share, or $250,000, for the second quarter of 1947, bringing this year's dividend record to $500,000 and the total to date to $30,405,000.

★ Sunshine and Metropolitan Mining companies, jointly and equally interested in the Yankee Girl vein east of the Metropolitan crosscut on the 3,100 level, are planning a drift development program which will follow the vein easterly into virgin territory. Westerly from this crosscut the Yankee Girl vein has developed tunnel-wide ore which averaged 20 oz. silver per ton for a length of 700 ft. Metropolitan owns a 16% interest in ore production from this area. Sunshine and Sunshine Consolidated own the vein westerly from the crosscut entering Sunshine Consolidated ground from the 3,100 level.

★ The Lucky Friday company has completed shipment of about 2,500 tons of ore to the Golconda custom mill. This ore was produced from development and stope preparation on the 1,400 level. The ore is a high-grade silver-lead product, described by engineers as being of tunnel width and 450 ft. long. The company is preparing to go on a steady production basis.

★ The south crosscut on the 2,800-ft. level of the Coeur d'Alene Mines property has reached its objective, the Coeur d'Alene Mines vein, about 1,000 ft. south of the shaft, but the ore disclosed so far has not been up to expectations.

★ Small Leasing Co., owner and operator of a tailings milling plant on Canyon Creek, north of Wallace, has taken a lease on the tailings and mine dumps at the old Continental mine, at Port Hill, in Boundary County, and is installing a prefabricated milling plant to handle an estimated 100,000 tons of tailings and low-grade ore. The prefabricated plant, said to be the first of its kind in the United States, is

manufactured by the Western-Knapp Engineering Co. of San Francisco. According to H. A. Myers, Western-Knapp manager at Spokane, the plant can be assembled at the mine in two days after a temporary foundation has been provided, and can be quickly taken apart and moved. The superstructure of the unit is made entirely of steel.

★ Federal Mining & Smelting Co. has declared a dividend of $1 per share, totaling $246,640, which brings the company's 1947 dividend record to $431,610 and the grand total to $31,967,350. Most of the company's profits accrue from the operation of the Morning, Page, and Frisco mines.

★ At the annual meeting of Lincoln Mining Co., held in Coeur d'Alene City on June 2, the board of directors declared a dividend of one cent per share on 1,228,326 shares of outstanding stock. The company obtains its revenue from royalties paid by Silver Dollar Mining Co. on ore extracted from the "Rotbart" mineral area being mined jointly by Sunshine, Silver Dollar, and Polaris.

★ Hecla Mining Co. is bulldozing a mountain road up Rock Creek between Wallace and Mullan, which, when completed, will be about seven miles long. The road is to expedite the prospecting of numerous mineral veins on the ground recently purchased and located by Hecla under the name of Rock Creek Mining Co., a subsidiary.

NEVADA

Rochester properties get large-scale development—Deepen main shaft at Copper Canyon

★ Two districts in northern Nevada, Government reports indicate, are the nation's foremost sources of tungsten, marketed in the form of high-grade scheelite concentrate. Nevada-Massachusetts Co., near Mill City, whose 300-ton concentrator was destroyed by fire two years ago, has been an outstanding producer of high-grade concentrate for some 24 years, and is still treating 400 tons per day. Getchell Mine, Inc., in the Potosi district, with a tungsten concentrator housed in its cyanide mill, is again treating 400 tons per day of scheelite from the nearby Riley mine of U. S. Vanadium Corporation. The concentrate is trucked some 360 miles south to Vanadium Corporation's finishing unit in the Basic Magnesium plant, at Henderson.

★ Rochester Consolidated Mines Co. has undertaken large-scale development of silver-gold properties at Rochester, Pershing County, having acquired and consolidated the Rochester Silver, Rochester Merger, Crown Point, and Rochester Plymouth

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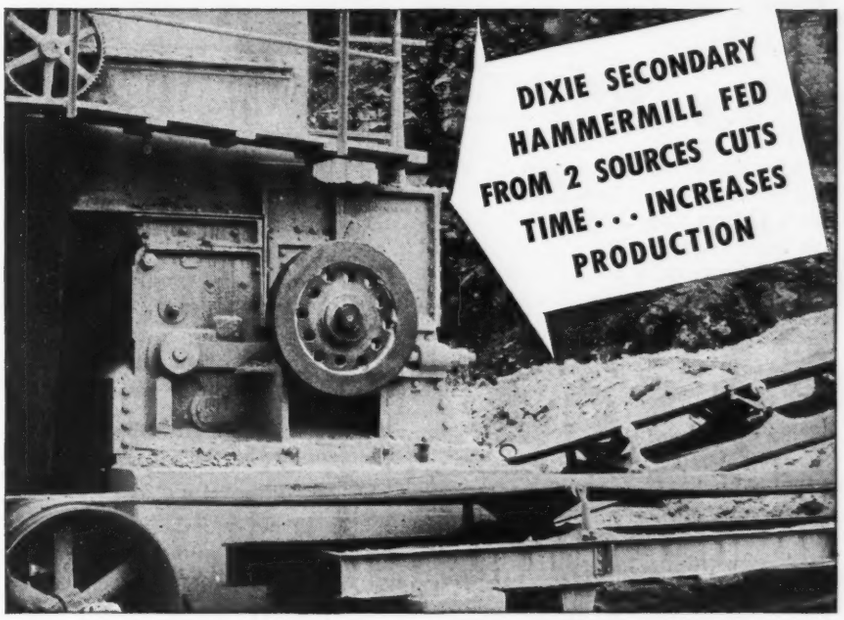

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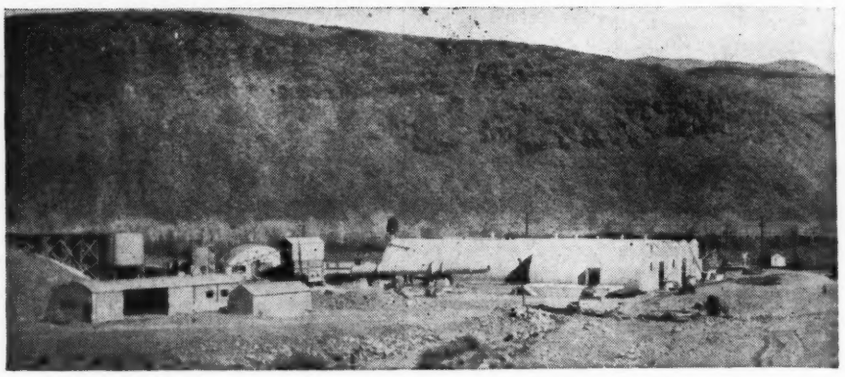

A DIATOMITE PLANT is under construction by the Eagle Picher Co. at Clark, Nev., to process the mineral from a nearby deposit into a variety of industrial materials.

Nevada (*Continued*)

properties that have recorded earlier production of around $10,000,000. Diesel-powered compressor units at the 1,800-ft. Pitt tunnel and higher-level 4-J tunnel are providing means, together with haulage equipment and mechanical muckers, to drive the rehabilitated tunnels into the Crown Point area in which a half dozen or more parallel ore channels were opened by shafts and a crosscut tunnel driven on the Crown Point from the eastern flank of the mountain ridge. Geologic investigation and sampling of ore faces have extended over a number of months, directed by William Huff Wagner, consulting engineer and geologist, of Washington, D. C., who has assumed direct management.

★ Newmont Mining, through its Esmeralda Operation, has been driving long crosscuts to the west at Goldfield, through formerly unproductive territory from the Florence shaft, at the 358-ft. level, and from the Silver Pick, near the 400 level. The Florence crosscut, at around 2,000 ft., has made connection for air with the 400-ft. Whiterock shaft, and in crossing the February claim, one of the Goldfield Consolidated Mines group, cut two zones of irregular gold-bearing quartz seams, resembling a stockwork of limited width. Within the first zone a 15-ft. raise was said to have yielded "stringer" samples assaying up to $1,200 gold per ton. The two zones, some 100 ft. apart, are being explored by raises and drifts.

★ Tonopah Mining Co. of Nevada reports 1946 production by lessees on its Mizpah mine, at Tonopah, of 1,892 tons, which was shipped to the A.S. & R. Garfield, Utah, smelter and yielded silver-gold value of $45.43 per ton, or $15 above the 1945 value. Royalty collected was $16,322, or $8.65 per ton, against $8,613 in 1945. Closing of the Garfield smelter early in the year by a labor strike cut the Mizpah output to a low figure. Net income was $53,443.48.

★ Goldacres Consolidated Mining Co., operating an open-cut mine and cyanide mill south of Beowawe, in Lander County, is reported by the management to be treating 400 tons per day of $7 gold ore. During the war years the Goldacres mine, with a smaller mill, was operated by Willow Creek Mines, Inc., long active in Alaska.

★ Consolidated Chollar, Gould & Savage Mining Co. is again treating 500 tons per day of low-grade gold ore in its cyanide mill at Gold Hill, on the Comstock lode. The plant had been closed for several months while stripping was in progress, involving the removal of over 300,000 tons of overburden. F. V. Dempsey, superintendent, was reported to have said that the company has purchased trucks to replace contract ore hauling.

★ Copper Canyon Mining Co. is preparing to sink its main shaft at least 250 ft. below the present 500-ft. depth, according to Robert H. Raring, managing engineer. The flotation mill has been operating at almost capacity of 350 tons per day.

★ Natomas Co., of California, has acquired ownership of the 12,000-cu. yd. bucketline dredge of Manhattan Gold Dredging Co., near Manhattan, Nye County, and is dismantling the unit prior to its removal to the Greenan placer, below Copper Canyon.

★ Consolidated Coppermines Corporation reports earnings of $493,361 for the first quarter of 1947, more than three times the figure for last year's corresponding period. The net was reported at $323,004.

WASHINGTON

Mining men protest Pend Oreille power dam — Howe Sound to resume production

★ Mining men of Spokane and the Northwest Mining Association, together with residents of Pend Oreille County, Idaho, and those living across the border in British Columbia, have raised a powerful wall of protest against the U. S. Army's plan to construct a power dam a mile south of the international boundary on the Pend Oreille River. This would create a 140-mile lake at an elevation of 2,062 ft. "The area has a potential value

of more than $6,000,000,000 in zinc-lead ores," declared Charles A. R. Lambly, general superintendent of Pend Oreille Mines & Metals Co., who has watched the work of the U. S. Geological Survey, the U. S. Bureau of Mines, and of mining companies in the area for the past 20 years. Lambly stated that mill facilities in the area have a capacity of 1,500 tons of ore a day. He also quoted the 1945 statement of Harold Ickes, then Secretary of the Interior, that the Metaline area had 19,000,000 tons of zinc-lead ore in sight. Dale I. Hayes, western manager of American Zinc, Lead & Smelting Co., said any dam which would increase the river level above 2,015 ft. would result in damage to mining properties.

Hearings on plans for building the huge power dam were conducted in late May at Metaline Falls, and at Sand Point, Idaho, by Col. L. H. Hewitt, Seattle district Army engineer. B. P. Thomas, a civil engineer for the Army, at Seattle, said that due consideration has been given to the mining industry but admitted some adits would have to be abandoned and some tunnels grouted. The Army's engineers felt that the Metaline rock is impervious to water, that flooding is unlikely, and that openings below the proposed lake's level can be sealed off. Many geologists and mining engineers brought out that the ores are in deep-lying limestone, which is full of caves and not impervious to water and that numerous diamond-drill holes put down both by companies and Government agencies would make it impossible to make the formation water-tight.

Contradicting views of Army engineers, Dale I. Hayes said Metaline Mining & Leasing Co. would object to any water level above 2,015 ft., and that Grandview Mines would be damaged by any level above 1,983 ft. Colonel Hewitt indicated that much of the information was unknown to the Army engineers, and explained that the detailed studies made by the U. S. Geological Survey and the U. S. Bureau of Mines during the war had been kept confidential at the request of mining companies whose properties were studied. He asked that the companies ease those restrictions so that Army engineers might study the reports. At a meeting of Northwest Mining Association on June 2, plans were made to file formal protests.

★A new State mine safety code for metallic and non-metallic mines was being formed at conferences held in Spokane during May. A third conference was to be held June 23, and on July 23 the code will be presented at a public hearing in Spokane, according to Dan Adair, State Supervisor of Safety. "The present growth of the mining industry in the State," Mr. Adair said, "warrants more complete safety regulations." The code will cover fire protection, hoisting and hauling of ore, waste, and men, handling and use of explosives from storage to final use, as well as general

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Washington (*Continued*)

safety rules and recommendations for working conditions. Among those attending the conference were Charles A. R. Lambly, superintendent of Pend Oreille Mines & Metals Co., Metaline Falls; John J. Curzon, manager of Howe Sound Mining Co., Holden; Frank Wagner, manager of Knob Hill Mines, Ltd., Republic; and union officials from Metaline Falls and Spokane.

★ American Chrome & Magnesium Industries, Inc., revealed plans on May 20, in Spokane, for operating the Rock Island ferro-silicon plant, near Wenatchee, and the Mead magnesium plant, at Spokane. According to A. L. Collette, Pacific Coast consulting engineer, the Rock Island plant will produce ferro-chrome from concentrates obtained as a byproduct from olivine ores from the Twin Sisters mountain area, and a pilot plant will be operated at Mead for a six-month period under a renewable 90-day option from the WAA. This operation is expected to prove the feasibility of extracting magnesium from the olivine ore deposits in the Twin Sisters area, in the western part of the State.

Olivine ore resources in the district are estimated to be capable of producing 500,000,000 tons of magnesium metal, the content ranging from 28 to 30%, compared with 12 to 14% magnesium in the dolomite used at Mead during the war. WAA turned down a bid of $8,000,000 for the plant from American Chrome earlier, saying Coulee Dam could not supply enough electricity to operate the plant profitably, but intimations now are that sufficient electricity will be available within the year. Alwyn H. Wild, president of American Chrome, of New York, estimated employment of 5,000 if the test proves successful, with expenditures in excess of $20,000,000 annually.

★ D. P. Morgan, consulting engineer for W. R. Grace & Co., of San Francisco, inspected the Mead magnesium plant in mid-May with the idea of reducing phosphate rock to a concentrate to be shipped to its fertilizer plant at Oakland, Calif.

★ Arthur Johnson, manager of Reynolds Metals Co.'s aluminum plant, at Longview, said a third of the potlines were to close May 15, but that no employees would be laid off because of the curtailment. C. K. Warren, heading the industrial committee of Longview's Chamber of Commerce, said that in talking to R. S. Reynolds, president of the company, by telephone, he had indicated that a complete shutdown was possible due to market conditions resulting in a surplus of pig aluminum.

★ Admiral Consolidated Mining Co., with property at Leadpoint, reelected its board of directors on May 26. President is F. J. Cardinal; secretary-treasurer, Mrs. J. Richard Brown. A 100-ton flotation mill being built at the

mine was expected to be in operation on June 10, according to Mrs. Brown. John Colby is manager at the property. Shipping of crude ore had been suspended because of a lack of miners, but was resumed on May 28.

★ Sullivan Mining Co. is conducting a diamond-drilling campaign in the Metaline zinc district in the northeastern part of the State. Hecla Mining Co. and Bunker Hill & Sullivan Mining & Concentrating Co., of the Coeur d'Alenes, each owns a half interest in the Sullivan company. Bob Sorenson, field representative for Hecla, has assigned Herb Harper, company engineer, to take charge of the work. Jess Havlick, of Spokane, has the drilling contract.

★ H. Louis Schermerhorn, of Spokane, president of Metaline Mining & Leasing Co., reported that the company operated at a net profit of $15,-181.24 during 1946. Zinc production amounted to 2,154 tons, and lead amounted to 392 tons. More than 14,-000 ft. of underground diamond drilling was done and more than 2,000 ft. of surface diamond drilling.

★ Howe Sound Mining Co., which suspended mill production last November at its copper-gold-zinc property at Holden, plans to resume mining operations Aug. 1. During the shutdown a crew of about 250 men has been engaged in important development work which was impossible during war years. In the course of 248 operating days during 1945, 491,402 tons of ore were milled for an average of 1,981 tons per day and employment averaged almost 300.

★ Among other developments in north-central Washington, Sidney Sherwood has installed a testing laboratory for analysis of ores at the Spokane mine, on the Twisp River. The road into the Alder mine, in Methow Valley, is being improved, and Spokane men who took over the mine last year plan to have a crew start work at the property soon. According to Frank Lilly, Spokane mining statistician, miners are beginning to open the gold mines in this area. He said at least five were operating in the Blewett area in May where only one operated last year, and that about a dozen companies will resume operations from Swauk north to Howe Sound's Chelan property. Gold Bond Mining Co., near Blewett, has two small mills, one operating and the other about ready to start. The ore will be shipped to the Tacoma smelter.

The pumice industry is also growing in this section. Operations are numerous in the Entiat Canyon, and in the Red Mountain area near Leavenworth. George W. Fouts and Bill Asher are operating 12 miles up Entiat Canyon from Stelike ranger station. Fouts has 29 concerns hauling the pumice by the yard, and averages 10 cu. yd. to a load. He took out 15,-000 yd. at $1.75 a yard in one year and says the business could be tripled with improved road conditions. His

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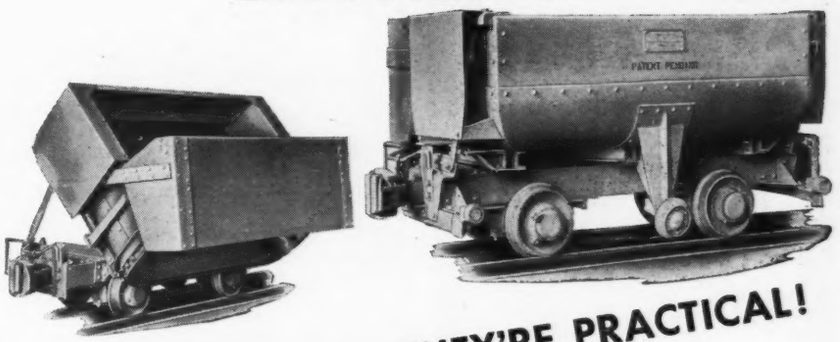

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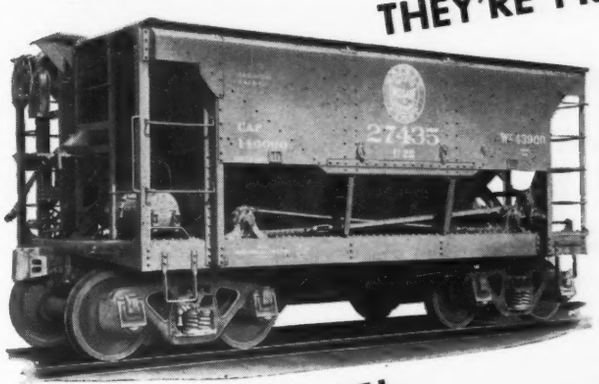

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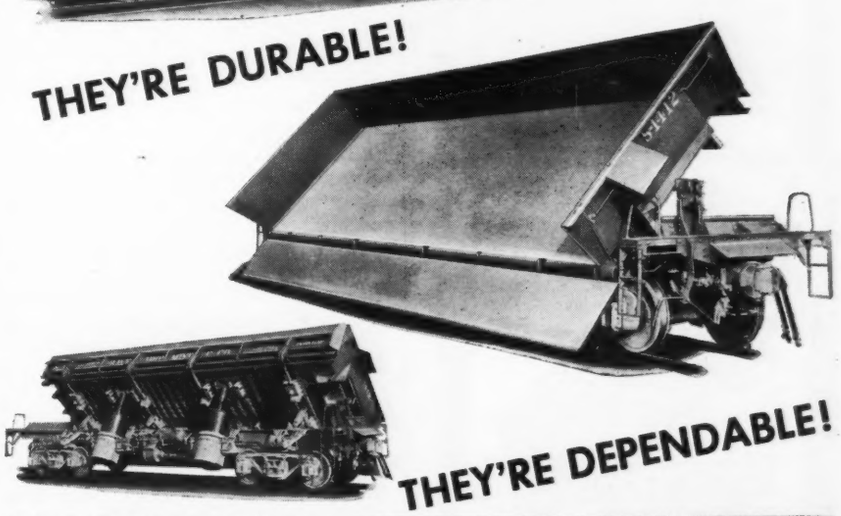

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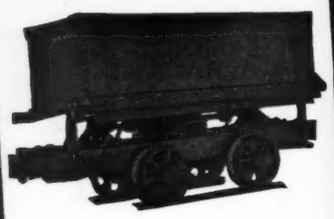

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Washington *(Continued)*

white pumice deposits average from 4 to 20 ft. in depth.

★ Pacific Mutual Silver Lead Co. has asked an extension of power lines by the P. U. D. of Ferry County to its mine, according to C. A. Gray, of Spokane, secretary. A geologist of the Bureau of Mines has recommended bulldozing the surface to locate more veins, followed by diamond drilling. Gray said ore of about $300,000 value is ready for mining and milling.

CALIFORNIA

Best Mines Co. to develop Gold Point mine — Diatomaceous earth plant near Lompoc to reopen

★ Best Mines Co., operating the Oxford and Gold Bluff gold properties, near Downieville, Sierra County, has purchased six claims adjoining these holdings on the north and leased the Gold Point gold mine, 5½ miles east of Downieville, following diamond drilling. Development work has been started at the Gold Point, and installation of housing facilities at the Oxford property is planned. The company is controlled by C. L. Best, with L. L. Huelsdonk, manager, directing operations. B. C. Austin is consulting engineer.

★ Bishop Assay and Engineering Office, Phillip Gardiner, operator, is starting development and exploration work at the recently acquired Reward and Brown Monster, in Owens Valley, Inyo County. The Reward mine, discovered in 1860, is credited with a production of several million dollars, mostly gold. Mining, transportation, and compressor equipment is available at the property.

★ La Salle Canyon diatomaceous earth plant near Lompoc, Santa Barbara County, is expected to reopen in July, according to Donald Grant, in charge of repair of equipment and buildings. The plant was recently purchased by Alexander Grant, New Mexico mining man. A building materials fabrication plant is to be constructed later. The initial force of 20 men will eventually be increased to 100.

★ A second dragline dredge unit has been placed in operation by Thompson Divide Mining Co. at its placer holdings in Trinity County. Additional drilling of the Trinity River project has been authorized near Minersville and Trinity Center, where the company plans to install a bucket-line dredge later. A. L. Daman is general manager, and Frank Warren, superintendent, is in charge of the Trinity County operations.

★ Dragline operations are scheduled to start soon at the gold-platinum holdings running along the Klamath River from Happy Camp to Seiad, Siskiyou County, controlled by the recently incorporated Gold Ventures, Ltd., Paul A. Bundy, president and general manager. Equipment formerly operated by Sunmar Dredging Co. at the Kelly-Dogtown placers, in Mono County, has been purchased.

★ Quicksilver output during 1946 came from 34 properties in 12 counties, and amounted to 17,804 flasks (76 lb.), worth $1,648,758 f.o.b. mine, as compared to 21,063 flasks, worth $2,697,835, produced in 1945 from 43 properties in 12 counties, according to the Division of Mines, Olaf P. Jenkins, State Mineralogist. The New Idria mine, in San Benito County, was the largest producer, followed by the Mt. Jackson mine, in Sonoma County; Reed mine, Yolo County; Guadalupe mine, Santa Clara County; and the Mt. Diablo mine, in Contra Costa County. As in the past, California led all other states, with about 70% of the nation's quicksilver output. Average value of quicksilver for the year was $98.24 per flask, New York, compared with $134.89 in 1945, $118.36 in 1944, and $195.21 in 1943. The California miner received an average of $92.61 per flask at the mine in 1946, compared with $128.08 in 1945.

ARIZONA

Large placer area to be strip-mined — Lewin Mathes Co. takes over Mardun Copper property

★ Weaver Placer Mines, Inc., will immediately develop 6,000 acres of placer mining area in southern Yavapai County, situated 28 miles north of Wickenburg and 8 miles east of Congress Junction. The company is capitalized at $300,000. Approximately 2,240 acres of the tract, all of which is owned by R. M. Merrill, of Los Angeles, Calif., has been leased outright for an advance sum of $20,000 plus royalties. The remaining acreage is under option to lease.

E. E. Nathansohn, of Los Angeles, active in the organization, said that $40,000 worth of equipment has already been bought and that further purchases are being made in Phoenix. Since discovery of this area in 1863 no attempt has been made by any organization to mine the deposit on a large and scientific scale, Nathansohn said. Present assays, he added, have indicated gold values ranging from 50¢ to $26 a yard. The average initial work cost is estimated at about 25¢ a yard. According to Nathansohn the deposit will aggregate approximately 173,000,000 cu. yd. in the entire 6,000 acres. It will be strip-mined with power shovels, bulldozers, and carryalls, the gravel being moved to a washing plant.

Associated with Nathansohn in the firm are R. E. Bowen, former chief engineer of the Indiana Power Co. and now a resident of Pomona, Calif.; and J. Carlton Bray, Phoenix mining engi-

neer and inventor of the straight-line placer mining machine. Mining operations will start within 60 days. The office will be in Wickenburg.

★ A large body of silver-lead ore has been discovered in the Ruth mine of the Calan Mining Co., 8 miles southwest of Prescott, according to Walter L. Smith, general manager of the company. The strike was made while a haulage tunnel was being driven. The vein is 7½ ft. wide at the point of contact. Smith described the orebody as sufficiently large to permit mining for the next 25 years. The Calan company has been developing the Ruth property for two years. It has been worked for many years.

★ The Mardun (Navajo) Copper Co. has been taken over by the Lewin Mathes Co., copper fabricators, of St. Louis, Mo. The property, situated in northern Arizona, comprises approximately 3,500 acres, much of which shows a stratum of copper-bearing sandstone. The depth of this stratum is unknown and it may be of considerably larger extent than so far indicated. Geologists differ in their opinions as to the source of the copper. It is generally considered, however, that the deposits were formed by copper-bearing solutions which entered the sandstone along fissures and spread out in permeable beds away from the fissures. It is also possible that continuous cycles of oxidation, leaching, reprecipitation, and erosion have concentrated the copper minerals in their present beds.

The copper occurs as a coating of carbonates and silicates on the sand grains of the sandstone. This coating is so light and friable that special methods of sampling and handling must be used. When drill holes are encountered in mining operations the walls of the holes are found to be coated with highgrade copper concentrates in paint-like fashion. Thus the original results obtained from the hole must have been low. Sample pulps must be specially handled, for the slightest disturbance will cause segregation of the valuable minerals. Actual mining has determined that values are some 30% higher than those indicated by conventional sampling methods. Future exploration and sampling by drilling will use several specially devised and tested methods to determine values.

The characteristic tendency of the ore to segregate had led to a unique and successful metallurgical process. The ore is ground in a beater-type mill and the valuable minerals are extracted by cyclones. Eighty-five percent recovery is obtained and no water is required. Concentrates average about 20% copper. It is planned to leach the concentrates and make cement copper on the ground. Sufficient water is available for this purpose, although scarce in this section.

★ Depletion of mineral reserves is a matter of grim reality to citizens of Jerome and the nearby town of Clarkdale. Copper is their economic life-

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Arizona (*Continued*)

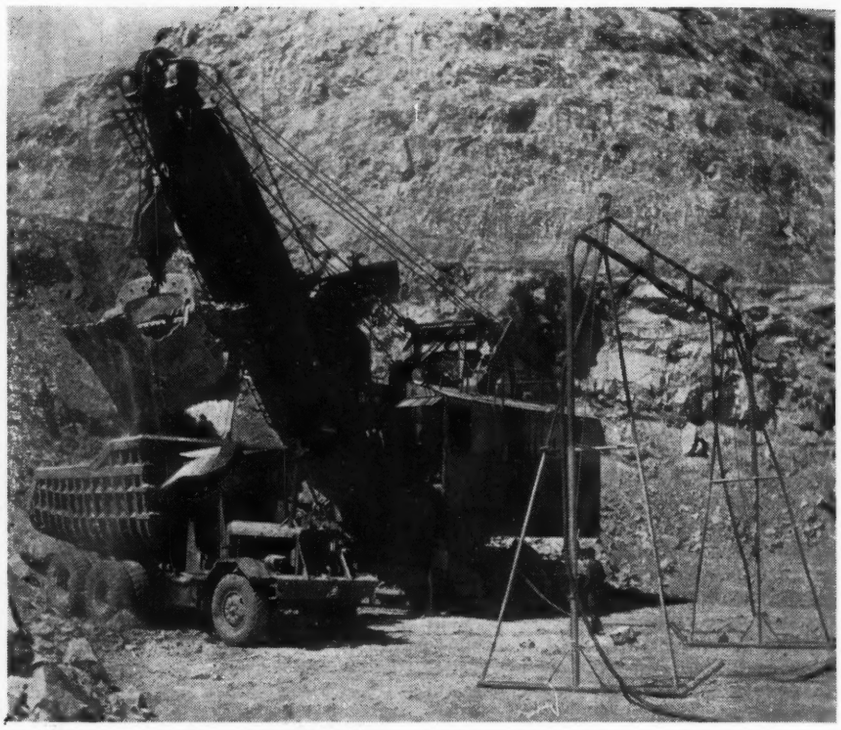
blood, and copper deposits in the Jerome district have been exhausted to such an extent that Phelps Dodge Corporation has announced it will cease operations this year. Recent efforts by the corporation to uncover new orebodies have been fruitless.

★ Great Lakes Carbon Co., of Chicago, Ill., has purchased the Snow White perlite claims four miles northwest of Superior, and has started preliminary exploration of the deposit by diamond drilling. The company also plans to operate the Walker-Talley property, south of Superior, which has been in production for some time, with shipments averaging 15 cars a month.

A seven-car spur is being built on the Magma railroad, where a crusher and loading bins will be erected to handle the Snow White production, which is expected to run four cars daily. All shipments will go to the enlarged Great Lake Carbon Co.'s popping plant in Torrence, Calif., which can now handle 300 tons daily.

★ Shattuck Denn Mining Corporation, of Bisbee, acting as agent for the Reconstruction Finance Corporation, is operating the Gila Fluorspar Project's Heavy-Media mill on the Gila River, 80 miles west of Silver City, N. M. H. R. Hendricks, chief metallurgist for Shattuck Denn, is in charge of operations at the mill. Coyne Hunt, of Bisbee, is plant superintendent. About 200 tons is treated daily.

★ Southwestern Mines, Inc., at Courtland, has shipped six carloads of oxidized copper ore from its Brown shaft to the Phelps Dodge smelter in Douglas. The ore averaged between 4% and 5% copper. The Leadville shaft has been retimbered and is ready for mining. In addition, the power line has been extended to the Highland shaft, hoist and headframes have been installed, and the necessary retimbering completed to make possible the unwatering of workings to the 300-ft. level. J. S. Coupal, of Phoenix, is consulting engineer.



CASTLE DOME COPPER CO.'S open-pit mine, near Miami, Ariz., uses 5-cu. yd. electric shovels to load ore into 20-cu. yd. trucks. Photo by Westinghouse Electric Corp.

NEW MEXICO

New potash concern operates in Carlsbad area

★ W. M. Cross, Jr., president of Continental Potash Co., of Kansas City, Mo, has confirmed reports that drilling done by his company in Eddy County has cored a section of soluble potash rich enough to warrant a trial of the solution mining process patented by Roy Cross, of Kansas City Testing Laboratories, in 1944. Cross said the company expects to build a small commercial plant but that certain phases of the solution mining process remain to be worked out. The process involves use of a solvent liquor of sodium chloride-potassium chloride which is heated to between 400 and 500 deg. F. and then circulated through the deposits. The brine is cycled to the surface, where cooling and selective precipitation take place.

★ The Carlsbad Chamber of Commerce is conducting an active fight against Senate Bill 1251, which provides for a national soil-fertility program, including the exploration of fertilizer resources on public lands. A statement signed by Victor L. Minter, secretary of the Carlsbad organization, which was circulated to chambers of commerce in Arizona, New Mexico, and West Texas, urged defeat of the legislation on the grounds that it would extend the Government's encroachment into private industry, lead to imports of foreign potash produced at slave-labor cost, and involve unwarranted expenditure of the taxpayers' funds through the proposed loans to agricultural cooperatives.

TRI-STATE

Union defers strike vote, asks counter-proposals—Student group tours district

★ With the expiration of a 30-day cooling-off period on June 14, Tri-State locals of the International Union of Mine, Mill & Smelter workers had yet to schedule individual strike votes before each local could conduct a secret referendum ballot to determine if the majority of each local's membership desires to strike, according to Howard Lee, regional director of the union. Lee reported that one of the largest locals, No. 861, comprising Eagle-Picher employees, was waiting to see counter-proposals being drafted by the company before taking any strike action. Negotiations with the company were broken off June 3. Lee said negotiations were to start June 16 between the St. Louis Smelting & Refining Co. and its employees. Five other locals comprise the Tri-State council of the union, which represents approximately 4,500 union and non-union members, according to a union representative. Lee also announced that a meeting of the Tri-State council would be held June 20 for the purpose of electing delegates to a conference of the international union to be held June 22 at Salt Lake City. The purpose of this special wage and contract conference was to consider the present status of negotiations with the various mining companies, Lee said. "We are not rushing into a strike without studying the company proposals, and we hope we won't have to consider a strike vote, particularly at this time," he explained.

Failure of Congress to enact legislation continuing premiums after June 30 was expected to throw about 3,000 men out of work.

★ The atomic era of research presents many problems to the engineering profession and the responsibility of keeping the country so strong that no other nation will ever attack us, Clyde Williams, who is the director of Battelle

Memorial Institute, at Columbus, Ohio, told the members of the Tri-State section, American Institute of Mining and Metallurgical Engineers, at a meeting May 14 in the Connors Hotel, at Joplin. "In this important work of the future the A.I.M.E. will make its contribution—that of keeping alive, through its membership, its technical publications and basic scientific knowledge as well as the cooperative spirit of working with the other fellow to develop new products, new methods, and greater productivity—as it has done in the past," Williams, who is president of the national organization, declared.

★ Sixty-four senior and graduate students in mining and metallurgical engineering from the Colorado School of Mines made Joplin their headquarters on May 14 and 15 for an inspection tour of mines, mills, plants, and smelters in the Tri-State district. They were accompanied by Prof. Clark B. Carpenter, head of the department of metallurgical engineering, and four other members of the school's faculty —Profs. C. F. Livingston, H. O. Davidson, W. M. Richtmann, and S. L. Smith. The party visited the Eagle-Picher Joplin plant, Paxson operation, west of Baxter Springs, and Central mill, at Cardin, and later inspected the coal-preparation plant and mine of the Pittsburg-Midway Coal Mining Co., in southeast Kansas, and the open-pit mine and stripping operations at the Oronogo Mutual Mining Co. at Oronogo.

ARKANSAS

State's bauxite reserves held ample for near future

★ Refuting a statement by Secretary of Commerce Averill Harriman that bauxite and other minerals are becoming scarce, Harold B. Foxall, State Geologist, recently asserted that Arkansas has approximately 42 million long wet tons of commercial-grade bauxite in reserve, in addition to a large quantity of lower-grade ore. About one million tons were mined last year and in 1945, he said. He expects production to remain at about this level for two or three years and then to drop. A peak wartime production of 7,085,272 tons was mined in 1943. Foxhall pointed out that the Government is now stock-piling high-grade abrasive ore which could be blended with lower-grade ore in the event of another emergency.

★ The suit brought by Glenn L. Martin, of Baltimore, to dissolve the Diamond Corporation of America, which at one time held a 50-year mining lease on the Pike County diamond deposits, has been dismissed. Last October Martin asked the court to dissolve the firm, contending that it was being mismanaged by the president, Ray E. Blich, of Chicago. The court also

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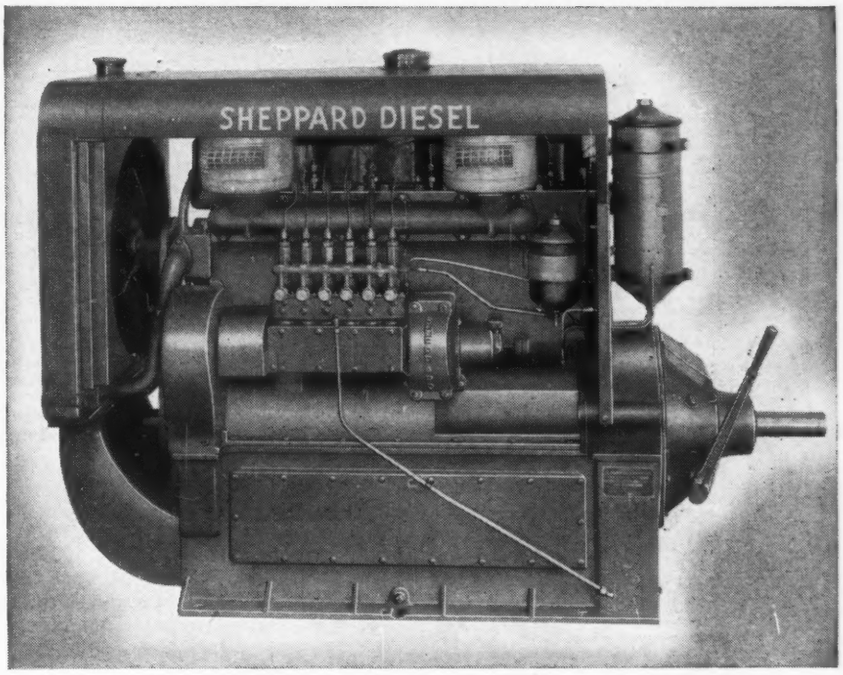

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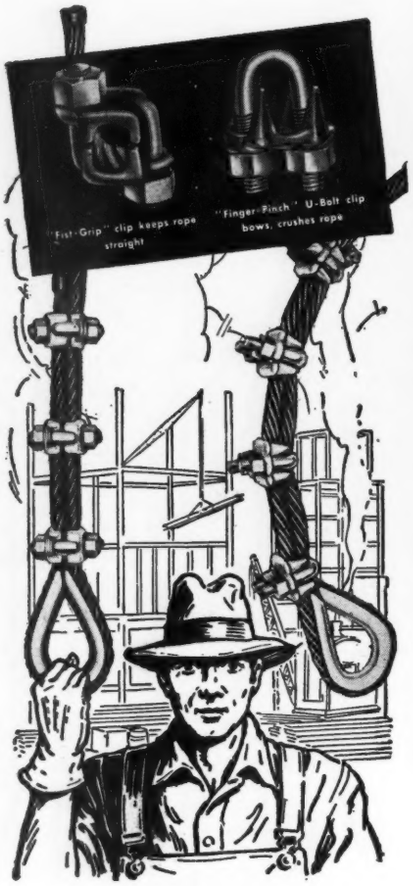

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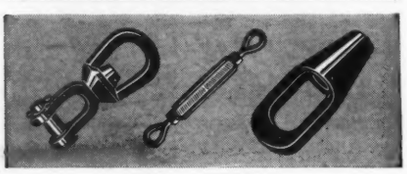


AERIAL VIEW of Bauxite, Ark., showing beneficiation and drying plant (foreground), offices (center) and community (above). This is the Arkansas headquarters of Alcoa Mining Co.

Arkansas (*Continued*)

ordered the release of $325,000 of the corporation's funds which were frozen in a St. Louis bank. Details of the out-of-court settlement were not revealed.

MISSOURI

American Zinc wins suit over sink-and-float-process

★ American Zinc, Lead & Smelting Co. announced on May 19 that the United States Circuit Court of Appeals at Kansas City, Mo., had affirmed the judgment of the United States District Court at Joplin, which was rendered in favor of the company and its associated corporation, Minerals Beneficiation, Inc., in a suit filed against these two companies by Charles B. Hebbard, formerly of Joplin. The issue involved the claim of Hebbard that he had invented a valuable method of ore separation based upon the principle of sink-and-float while employed by the defendant companies under a contract by which he was to be paid the fair value of any commercially valuable invention he might make while in their employ. The defendant companies contended that Hebbard's employment contract gave them title to any invention he made and that there was no basis for his contention that he had not been fully compensated under the contract.

The process involved in the lawsuit, in which the invention of Hebbard was a minor part, was developed in 1936 at the Mascot, Tenn., operations of American Zinc, Lead & Smelting, where the first successful sink-and-float separation of metallic ores was demonstrated by the H.M.S. process.

KENTUCKY

Aluminum Ore and Minerva Oil Co. prospect fluorspar tracts

★ The Minerva Oil Co., zinc and fluorspar producer, began drilling early in June on properties in Livingston County, which it recently acquired under lease. Three machines are in operation. The property, embracing a substantial acreage, is in the section of the county near Joy.

★ The Aluminum Ore Co., fluorspar division, using a Buda power auger drill, is engaged in prospecting the Half Haw fluorspar tract near Mexico, in Crittenden County.

NORTH CAROLINA

Substantial mica-mining project under way in Macon County

★ R. G. Lichtenstein, of Oil City, Pa., and associates, have purchased the mica and mining properties of Andy W. Reid, Franklin mining man and operator of Reid's scrap plant at Iotla Bridge, and have formed a corporation known as Mica Products Corporation to mine and process mica in Macon County. Principal offices of the new corporation will be at Franklin. The initial investment was said to be around $300,000, and another $200,000 will be spent on constructing and equipping a plant to be operated in connection with the mine and processing plant.

The company has acquired about 700 acres in Millshoal and Cowee townships, and mining operations on a small scale are expected to begin im-

mediately. The company expects eventually to employ around 100 persons. Present plans call for the construction of a scrap-mica plant at the intersection of Watauga Creek and the Little Tennessee River, and a pattern and punch shop at a location yet undetermined. The Reid scrap mill, at Iotla Bridge, will continue operations. The company has retained the consulting firm of Behre Dolbear & Co., New York, whose engineers have been doing exploratory work in the area.

IRON COUNTRY

Companies and unions sign new two-year contracts — Jones & Laughlin laboratory completed

★ Several conferences have recently been held between mining officials and the United Steel Workers, CIO, representing iron-ore miners of the Lake Superior region. Oliver Iron Mining Co. and the union came to terms on a new two-year contract which extends to April 30, 1949, and calls for a 12½c. per hour increase in wages, vacation pay, and withdrawal of the CIO portal-to-portal lawsuits filed some months ago. Other companies signed on similar terms, but North Range Mining Co. incurred a two-day work stoppage when agreement was delayed.

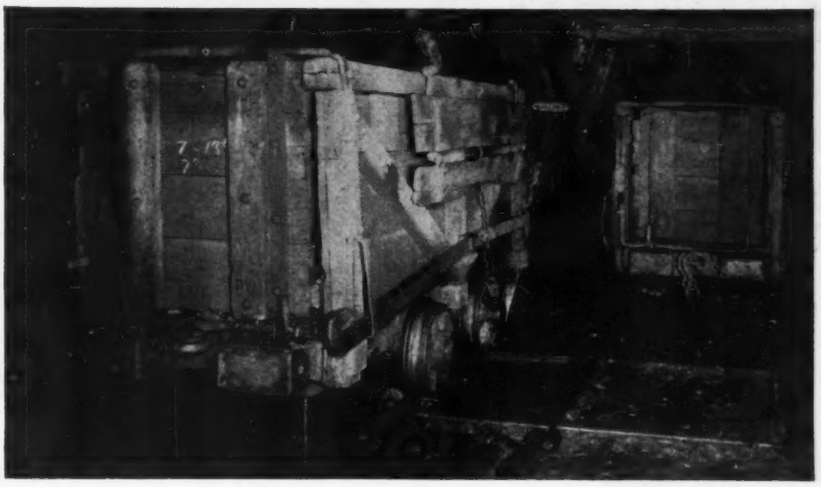
★ North Range Mining Co. has turned over the Mary Charlotte mine, at Negaunee, Mich., to Interstate Iron Co. a subsidiary of Jones & Laughlin Co. About 130 men were employed at the mine.

★ The research laboratory being constructed on the Buffalo Hills site, southeast of Negaunee, Mich., for Jones & Laughlin Co. is almost completed and ready for occupancy. The building is 140 ft. long by 40 ft. wide. At the front the offices and laboratory occupy two stories and basement. The rear 94 ft. of the building contains a pilot plant with crushing and grinding equipment. A 5-ton traveling crane covers the entire area. Harry Peterson is general superintendent and Francis X. Tartaron, chief metallurgist, will be in charge of the laboratory.

★ Oliver Iron Mining Co. bid successfully June 10 for three taconite units in tax-forfeited lands at the eastern end of the Mesabi Range, near Aurora, Minn., overbidding Pickands, Mather Co.'s bid of 14c. per ton royalty to the State by 1 to 2c. The entry of Oliver Iron Mining Co. into the taconite development field came as Pickands, Mather prepared to open Minnesota's first commercial taconite plant, at Aurora, July 1. According to Ray Nolan, State Director of Lands and Minerals, the Aurora plant will have a capacity of 250,000 tons of high-grade concentrate a year.

Other property acquired by Oliver

CANTON CAR TRANSFER



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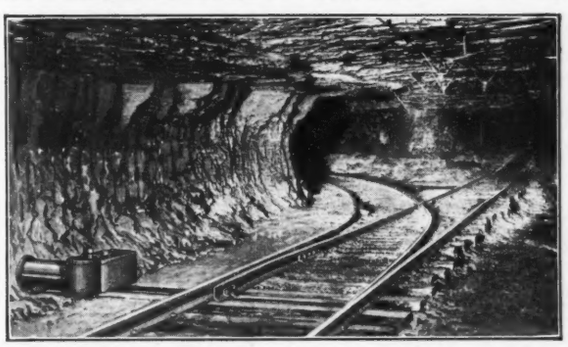

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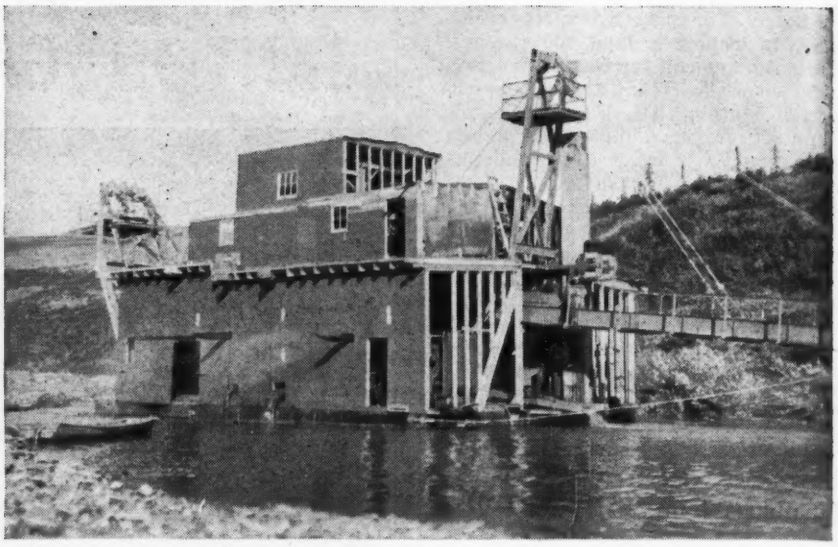

OPERATING 140 MILES NORTH of the Arctic Circle, this gold dredge of the Lammers Exploration Co., of Spokane, Wash., may well claim to be the most northerly project of its kind in the world. It is situated on a branch of the Kobuck River, northeast of Kotzebue, Alaska. The diesel-electric powered dredge is equipped with 3-ft. buckets and averages 2,800 cu. yd. per day. It was erected in 32 working days by a 16-man crew which included 10 Eskimos, and began operation in the summer of 1946. Crews are flown in a distance of 3,600 miles from Spokane for each season's operations. The company estimates that its 16 miles of claims contain gravel sufficient for 20 years' dredging. Graham D. Lammers is manager.

Iron Country *(Continued)*

are 200,000 tons of ore in the Wheeling, Pilot and two Hanna sections near Mountain Iron; also three unexplored units in the Prindle section, near Virginia, and nine scattered mining units.

Pickands, Mather has the largest holdings of taconite properties in the State. Fifty State-owned properties leased to the company comprise about 5,000 acres.

ALASKA

Favorable season seen for U. S. Smelting—Report gold strike near Hirst Chichagof

★ Aner Erickson, who is superintending operations at the Dolomi mine of Santiago-Alaska Mines, Inc., on Prince of Wales Island, about 25 miles from Ketchikan, reports that with the completion of the 500-hp. hydro installation at the property it will have the most modern plant in the Territory. Ten men were employed in early May, and plans are for production of 50 to 100 tons of ore daily when the plant is in full operation with a crew of about 25 men. Erickson stated that about $100,000 may be spent at the property this year.

★ Salmon Gold Co. is employing about 40 men at its property above Hyder. Eight hundred feet of new tunnel was driven during the winter. The Riverside tungsten mine, near Hyder, is also operating steadily. Dr. Mandy, mining engineer, is supervising development work at the Big Four Mine, in the same vicinity, where work has been in progress for the past year. It was reported that concentrates would soon be shipped from this property.

★ Roy B. Earling, general manager of United States Smelting, Refining & Mining Co., at Fairbanks, recently expressed concern over the shipping situation but was optimistic over the outlook for this season's work in spite of this and the labor shortage. Dredges at Ester and Chatanika were operating in early spring and those at Pedro Creek were expected to start soon. Thawing and stripping will be done at Engineer, Pedro, Fairbanks, and Chatanika creeks, and perhaps at Dome and Little Eldorado if enough men become available.

★ The U. S. Bureau of Mines has men inspecting mercury deposits in the Tolitna River district and on the Kuskokwim River, near Slietmut. Wilford Wright, engineer, is at the Red Devil mine, near Slietmut, planning for future development. This mine was closed by Kuskokwim Mining Co. for the winter.

★ Ralph Lomen, of Nome, has taken an option on R. W. Silver's Shamrock mine, near the Big Hurrah, in the Solomon River area, and planned to start work about the middle of June.

★ George Marsh, Alf Stromberg, Harry Shippey, Emil Johnson, and Oscar Petersen, all of Goodnews Bay Mining Co., left Anchorage early in May for the property at Platinum. The company has had several platinum prospectors and engineers investigating deposits this spring in the Poorman and Colorado area, west of Fairbanks.

Winston Spencer, the company's engineer, took three drillers to the properties in mid-May.

★ Willow Mining Co.'s property, 50 miles west of Wasilla, will be operated under the direction of Lee Dolan, of Anchorage, with a crew of about 20 men. Plans are being made for the erection of a larger mill at the property this fall.

★ Jade valued at between $20,000 and $30,000, which had been mined by Arctic Exploration Co., Inc., along the Kobuk River, in the northern part of Seward Peninsula, was stolen recently from a storage lot in Seattle, but later recovered. There were more than five tons of the mineral in boulders weighing from 200 to 1,500 lb. each. According to Norman C. Stines, consulting engineer for the Arctic company, plans had been made to ship the mineral to China.

★ B. D. Stewart, of the Territorial Department of Mines, has expressed optimism over the prospects of a good season of mining. He expects the activities to equal or better those of last year, and held that labor conditions would be improved.

★ A gold strike was reported by Harry Lucas, of Juneau, as having been made in the vicinity of the Hirst Chichagof mine, with samples assaying as much as $2,400 to the ton. He said five men will work the property this summer.

CANADA

Labrador drilling operations resumed — Pickle Crow reports new ore area — Consolidated Smelting grants wage rise

★ J. G. McCrea, president of the Canadian Metal Mining Association, reported at the annual meeting that 60 major operating mines are now members of the association. They embrace all sections of the Dominion and every branch of the industry. It is the object of the organization to keep in close touch with various Government departments on matters affecting the industry. The activities include research and the accumulation and analysis of information about metal mining for the benefit of Government agencies and other industries as well as member companies. V. C. Wansbrough is executive director.

★ Labrador Mining & Exploration Co. has reported that light drilling machines started operating early in June on the Labrador iron range and the northwest extension on the concession held by Hollinger Exploration. Heavier machines, good for a maximum 400-ft. depth, were to be ready for work about a month later. The purpose of the light rigs, having a limit of 60-ft. depth, will be to explore potential widths of a number of ore-

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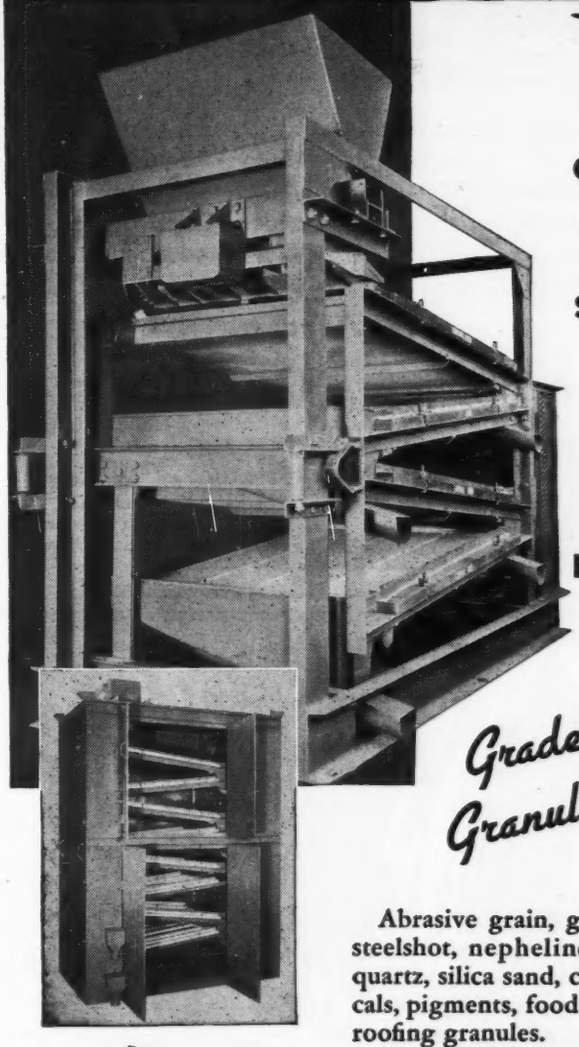

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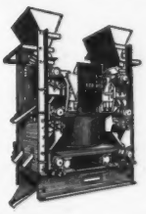

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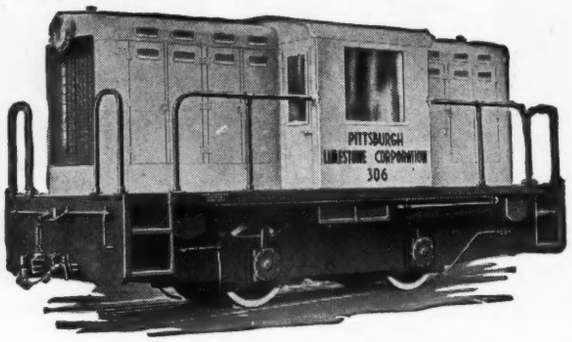

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Canada (*Continued*)

bodies where the hematite dips under overburden. Poor flying conditions have delayed starting the extensive program planned for this year, estimated to cost about $900,000.

★ The labor dispute involving Consolidated Mining & Smelting Co. has resulted in wage increases of 13 to 15¢ an hour for 4,500 mine and smelter employees. Sherritt Gordon miners, in Manitoba, voted for a strike, but the action was later shown to be illegal, and resulted in further discussions between the union and the company.

At International Nickel Co.'s Port Colborne smelter a wage dispute was submitted to a conciliation board. On May 30 the contract expired between the company and the International Union of Mine, Mill and Smelter Workers (CIO). The union is asking for a new pay level of $1 per hour, 20¢ higher than the present rate.

At the Porcupine camp, in Ontario, several disputes involving gold mines are under consideration. The conciliation boards do not expect to reach settlements for several weeks. In Kirkland Lake other conciliation cases involve the check-off, which was not granted in two of the latest settlements involving the Lake Shore and East Malartic mines.

★ Writs have been obtained by Minerals Separation North American Corporation against 18 Canadian mining companies to secure payment of royalties for patents on certain gold flotation processes. On May 29 the Canadian Exchequer Court, at Ottawa, announced a judgment for patent infringement against Noranda Mines. This was the first action to be settled, requiring the payment of damages after the amount due had been determined by an inquiry.

ONTARIO

★ Michipicoten Iron Mines, controlled by Sherritt Gordon Mines, reports that rehabilitation of the Josephine mine would cost more than $1,000,000, as a result of the caving that took place Oct. 13, 1946. Since this cost exceeds the present value of the known ore, it has been decided not to resume work at the property. The Ruth and Lucy siderite properties, located within two miles of the Josephine mine, have been optioned by a Jones & Laughlin subsidiary for a two-year period. The Lucy property is to be tested by 10,000 ft. of diamond drilling. Tonnage possibilities on both the Ruth and Lucy tracts are believed to indicate production of better than 1,000,000 tons a year. The lease provides for a 50-year extension if favorable results are secured from preliminary drilling. All ore that may be shipped will return the owner a royalty of 30¢ a ton. Eldon L. Brown is president of both Michipicoten Iron Mines and Sherritt Gordon.

★ John E. Hammell, president of

Pickle Crow Gold Mines, reports indications of an important new ore area on the 1,350 ft. level at the west end of the main mine workings. Values occur in two parallel quartz veins that average $17.85 in gold per ton over a 2-ft. width for a length of 225 ft. Values in this area were indicated several years ago by diamond-drill holes that intersected a band of iron formation. The newly found quartz veins are parallel to the iron formation and about 100 ft. to the south. At a depth of 100 ft. below the 1,350 level a drill hole has intersected good-grade ore. Mill capacity at Pickle Crow is 400 tons a day, compared with the average of 280 tons treated daily in April. A. G. Hattie is mine manager and Hector Monette assistant manager.

★ Sylvanite Gold Mines, Kirkland Lake producer, reports that drifting east of the No. 5 internal shaft on the 4,650-ft. level has opened a length of more than 475 ft. of ore in the "01" vein, the main north "A" break. Normal mine grade has been found in the new section across the width of the drift. The same ore has been opened on the 4,500 level for a length of about 125 ft., and values are continuing as work advances. These developments represent the major discovery made since the 16 new levels were established by the No. 5 shaft, below the 3,150 ft. horizon. Limited work has been attempted between the 4,650 and 5,500 levels. The mill rate has advanced from an average of 313 tons a day in 1945 and 423 in 1946 to 475 in April 1947. Labor conditions at the mine have improved to the point where employment is now about normal. K. G. Gray is general manager; W. V. Moot is president and managing director.

★ American Nepheline, Ltd., located 35 miles northeast of Peterborough, in May started operating its new mill, which produces about 150 tons daily as a glass-grade material. The remaining production of 250 tons is being shipped daily to the subsidiary plant of American Nepheline Corporation at Rochester, N. Y., where it is ground fine and sold to local markets.

Nepheline syenite is being produced from underground mining and from open quarries. New quarrying operations are being started from a low-corundum deposit less than a mile from the new mill. The syenite formerly produced has required flotation for removal of the corundum content. At the original workings 900,000 tons of low-corundum ore and 2,000,000 tons of ore high in corundum have been indicated by diamond drilling. Controlled by Ventures, Ltd., American Nepheline, Ltd., has Ernest Craig as manager and E. B. Wright as mine superintendent.

QUEBEC

★ D. H. Angus, president of Consolidated Beattie Mines, reported at the annual meeting on June 9 that operating loss in May amounted to about $33,000 as a result of the heavy rehabilitation program for removing the surface clay that had blocked the underground workings. The mine was expected soon to be in normal operation. Exploratory work from the Donchester shaft was reported to have indicated an improved ore grade.

★ Andrew Robertson, general manager of Buffadison Gold Mines, reports that drifting on the 660-ft. level has produced muck samples averaging $19.60 per ton in an area where only low values were secured from earlier diamond-drill holes. A drill hole 200 ft. farther east had indicated good values, which give promise of continued favorable results from the work on this horizon. From the shaft to the property boundary is a distance of 1,200 ft., of which 800 ft. was indicated by drilling to average $21.70 across 3.4 ft. The north vein system, which was previously shown by drilling to grade $16.45 across 5.7 ft., is being explored on the 810-ft. level.

★ Production was planned before the end of June by New Marlon Gold Mines, as reported by the president, J. J. Coghlan. The Francoeur mill, 12½ miles away, has been purchased and is ready to start operating at a rate of about 125 tons a day. The three-compartment shaft to a depth of 525 ft. had led to 2,000 ft. of lateral work to the end of February. Face and muck samples, before raises had been driven, averaged about $12 a ton. Recent drifting on the 150-ft. level has extended the ore to a length of 141.5 ft., grading $14 across the full drift width of 5.7 ft.

MANITOBA

★ The annual report of Sherritt Gordon Mines, Ltd., for the year ended Dec. 31, 1946, details the operations and exploration of the parent company and of Michipicoten Iron Mines, Ltd. Production at Sherridon was handicapped by a shortage of underground labor, resulting in a decrease in the tonnage milled, copper produced, and in gross earnings. Eldon L. Brown, president, reported that "exhaustion of the mine at Sherridon is now proceeding at a rate which should permit of the plant being released in time to be used in equipping our new copper-nickel mines for production." The East mine was finally exhausted during the latter months of 1946, and part of this mining plant has been shipped to Lynn Lake. The West mine will be worked at capacity, approximately 500,000 tons per year, during the present year, after which tonnage will gradually decline for two or three years. Ore reserves in the West mine, as at the year end, are calculated to be 1,368,000 tons averaging 2.60% copper; 2-12% zinc; 0.021 oz. gold, and 0.61 oz. silver per ton.

Total 1946 production cost was $2,462,023, leaving an operating

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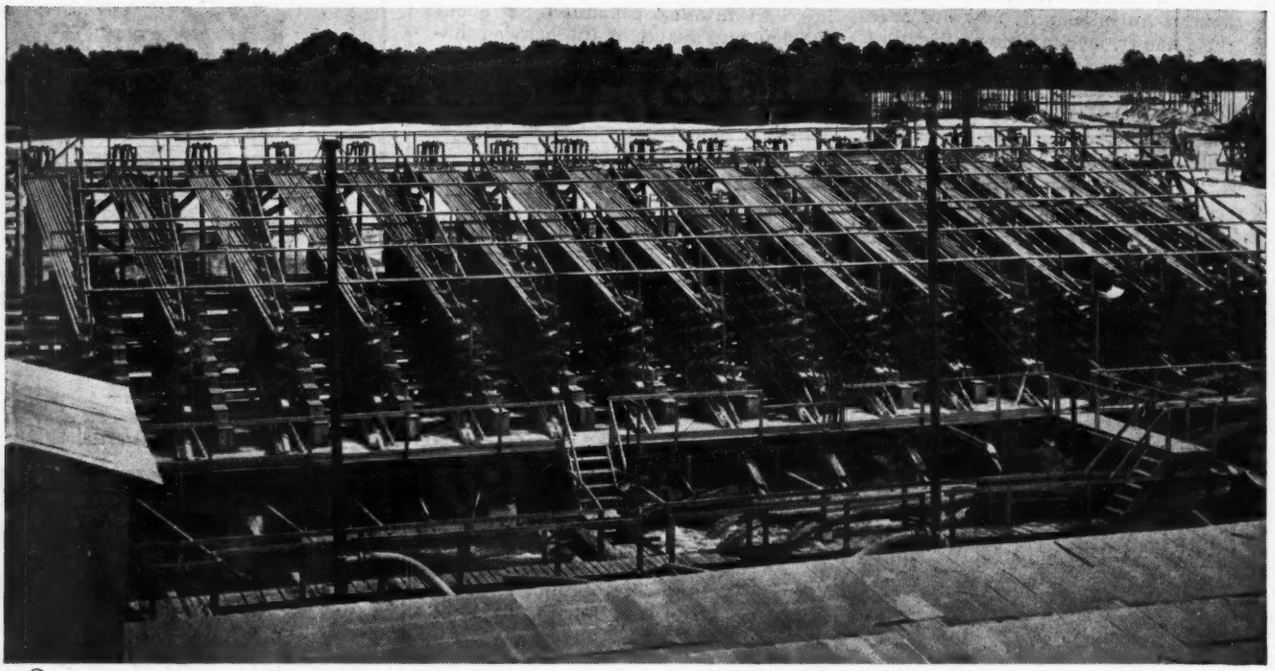

HUMPHREYS SPIRAL CONCENTRATORS handle 7,500 tons of rutile-ilmenite sands daily in the Humphreys Gold Corporation plant at Jacksonville, Fla. Capacity has been enlarged since the plant was first described in the March 1945 issue of *E.&M.J.* Pictured are 192 of the 252 five-turn rougher spirals, which, with 48 second-stage and 16 third-stage spirals, are operated by three men per shift. The rough concentrate is dried and the heavy minerals are separated by electromagnetic and electrostatic equipment for recovery of rutile and ilmenite. During 19 months' operation total cost of spiral concentration, including pumping and disposal of tailing, ran 5.12c. per ton of feed.

Canada (*Continued*)

profit of $1,103,012, which, after provision for taxes, depreciation, and other deductions, result in a net profit of $682,374. Current assets are listed as $1,992,407, against which are current liabilities of $492,808.

At the annual meeting of shareholders held May 27, the president of the company stated that the present demand by the union for a wage increase of 36¢ per hour, if granted, would add more than $500,000 to the annual payroll. Such a wage increase would reduce the tonnage of ore capable of salvage and further curtail the limited life of the mine. The union has applied for the appointment of a conciliator.

Total indicated ore reserves of the Lynn Lake nickel-copper property were given as 6,800,000 tons averaging 1.74% nickel and 0.75% copper. Of this total, 1,827,000 tons, averaging 3.28% nickel and 1.16% copper, has resulted from the drilling of the "L" anomaly, now known as the E L orebody. There appears to be no doubt that this tonnage will be increased by exploration at deeper horizons. The discovery of the E L orebody has resulted in the deferment of shaft-sinking operations until the possibilities of this new ore zone have been explored. However, it is obvious that shafts will eventually have to be sunk to permit drilling of both the "A" and "E" orebodies and the E L orebody from around the 1,000-ft. horizon. The company now feels that it has reasonable assurance of one-half of the initial objective of 20,000,000 tons and that the ensuing year will place this goal within reach. Expenditures on the Lynn Lake property during the past year were $619,828, and it is anticipated that the present year's program will be of approximately the same magnitude. Shaft sinking is expected to be under way by the latter half of the year.

The company has no immediate plans for major financing, as it is felt sufficient capital is in hand to develop the property to the point where the element of speculation has been minimized or eliminated. One of the major items is the development of an adequate supply of hydroelectric power. The Granville Falls site, on the Churchill River, some 60 miles from the property, has been selected as the most suitable location, and a priority permit obtained from the Manitoba Government for its development. This site has a potential capacity of 150,000 hp., but initial development will probably be one-third of this figure. Dr. T. H. Hogg has been retained as consulting engineer in connection with the project.

★ Fire at the Ferro property of Wekusko Consolidated, Ltd., has destroyed the air compressor and diesel engine plant. It was hoped that this equipment would be replaced and underground work resumed by the end of June.

★ Central Manitoba Mines, Ltd., reports the optioning of a small group of claims at Ospwagan Lake, 20 miles north of Mile 184, on the Hudson Bay Railway, and the staking of a larger contiguous group. The location was the scene of some exploration for nickel several years ago. Preliminary examination by the company has revealed strong magnetic anomalies.

★ The report of Hudson Bay Mining & Smelting Co., Ltd., covering the first quarter of 1947, reveals that 450,235 tons were milled during the period and that estimated net earnings will be $2,800,743 after all deductions, equivalent to $1.02 per share. R. H. Channing, president, at the annual meeting of the company disclosed that a new orebody or ore zone had been indicated by drilling during the present year. This body is located in the southeastern portion of the mine property in Manitoba. It was also announced that the projected plant for treatment of zinc residues would be of at least 300 tons' capacity. The plant will be designed to handle current production and also reduce the stockpile, now reported at 653,000 tons.

★ The annual report of Gunnar Gold Mines, Ltd., for the year ended Dec. 31, 1946, reveals that the Ogama-Rockland Gold Mines, Ltd., operation in Manitoba remains the company's most active interest. A three-compartment vertical shaft was sunk to 404 ft. Drifting has revealed some good lengths of ore, and results have been so encouraging that it is planned to deepen the shaft to 775 ft. and develop three more levels at 125-ft. in-

Canada (*Continued*)

tervals. It is anticipated that information obtained during the present year will make possible a decision as to mill requirements. Current assets are $425,359, with liabilities of $6,355.

BRITISH COLUMBIA

★ Difficulties confronting exploration companies and diamond-drilling companies were discussed at a recent meeting of representatives of B. C. mining operators, employees, and the Board of Industrial Relations. After the hearing it was agreed between the operators and the International Union of Mine, Mill and Smelter Workers to make joint application requesting that: each individual mining operator and each union local so desiring shall make joint application to work in excess of 44 hours in a week. Such applications will in each case cover the duration of the collective agreements now in force. Diamond drilling is to be considered as being included in the mining industry and joint applicants will specifically request the Board to grant all such applications received. Also that the Board exempt from the provisions of the Hours of Work Act any mining operation in the province properly designated as exploratory, this to include diamond drilling and transportation.

★ May production of Polaris-Taku Mining Co., Ltd., in the Atlin district, was 2,416 oz. gold, compared with 2,023 oz. in April and 1,587 oz. in March. Grade has increased together with tonnage, and in May the recovered heads represented 0.369 oz. gold per ton. A revaluation of ore reserves, necessitated through rising costs and the parity of the Canadian dollar, gives an estimate of 230,000 tons averaging 0.45 oz. gold per ton.

★ An intersection of 10.5 ft. of vein material, averaging 0.07 oz. gold and 36.0 oz. silver per ton, has been obtained by Big Four Silver Mines, Ltd., operating in the Portland Canal district, at 75 ft. in a flat diamond-drill hole driven from the No. 1 sublevel on the No. 1 vein.

★ Nitinat Mines, Ltd., initiated gold production from its new 25-ton flotation mill at the Black Panther mine, 14 miles southeast of Port Alberni, on May 1. The company thus becomes the first new gold producer in the province since the end of the war. This is also the first output recorded in that section of the Alberni district. Presently developed ore reserves are valued in excess of $300,000 and are minable from underground adits driven in the past.

★ The Little Billie shaft of Vanada Mining Co., Ltd., on Texada Island, is being extended from the 480-ft. level to the 605-ft. horizon to open a new low level and develop orebodies indicated at that depth by diamond drilling. An 8-ft. intersection assaying

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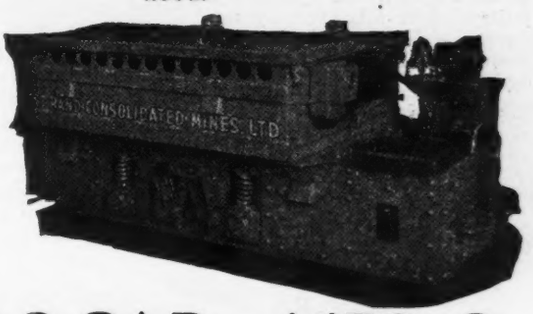

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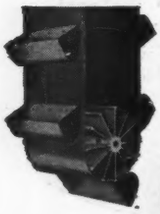
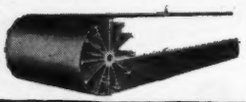


Used as an elevator pulley

Used as tail pulley on belt conveyor



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Canada *(Continued)*

1.67 oz. gold with correspondingly high values in silver and copper has been obtained in a down-hole driven from the 280-ft. level in the vicinity of the Centre orebody, and is thought to be correlated with a 25-ft. intersection found in an up-hole from the 480-ft. level.

★ Bralorne Mines, Ltd., British Columbia's leading gold producer, will commence underground development of its extensive holdings on Blue Creek, in the Yalakom section of the Lillooet district, as soon as construction of a "cat" road is completed.

★ Shareholders of Cariboo Gold Quartz Mining Co., Ltd., learned at the annual meeting of the construction of 52 housing units of the most modern type at the company's mine at Wells. C. D. Stevenson, general manager, estimated the sinking of the new five-compartment shaft to a depth of 1,000 ft. in the vicinity of the No. 1 ore zone would require 18 months. He said recent low mill heads were the result of a policy calling for treatment of all material that would pay the cost of milling.

★ Since operation was resumed early this year by Duthie Mines (1946), Ltd., at Smithers, the mine camp has been rehabilitated to accommodate 75 men, underground workings have been reopened, and 5,291 ft. of surface diamond drilling has been done on the Canary and Hummingbird claims. The drilling program has indicated reserves of 75,482 tons of ore assaying 0.09 oz. Au, 5.9 oz. Ag, 3.1% Pb, and 7.6% Zn, for a gross value of $29.46 at present metal prices. J. E. R. Wood, managing director, estimates net return at $15.52 per ton after consideration for all mill losses, freight, smelter and other charges.

★ The management of Brooklyn-Stemwinder Gold Mines, Ltd., in Greenwood mining division, is considering the construction of a mill as a result of the consistently encouraging results of exploration and development. Two new veins have been discovered following surface stripping by bulldozer. One assays 1.02 oz. gold and 6.65% copper per ton over a 3-ft. width; the other, 0.02 oz. gold and 5.35% copper over the full pit.

★ Western Exploration Co., Ltd., in the Slocan district, has resumed milling, which will be gradually increased to capacity as the supply of labor permits. First ore is being drawn from the Enterprise mine, although development work is also in progress at the Standard mine. Ore reserves have been estimated as sufficient to provide for three years' milling at capacity.

YUKON

★ The south drift of Brown-McDade Mines, Ltd., in the Carmacks district, has entered a section of lower values at a distance of 200 ft. from the Main crosscut. Diamond drilling has indicated that within 60 ft. the vein will widen to more than 4 ft. assaying 0.5 oz. gold and 3 oz. silver per ton. The grade of ore in the north drift has been materially better, a length of 160 ft. averaging 0.486 oz. gold and 4.16 oz. silver per ton over full drift width. The vein, as had been anticipated from diamond drilling, is pinching in the north face, but values are high. Another diamond-drill intersection less than 100 ft. ahead of the face indicates a width of 30 ft. of vein material, of which a 14-ft. section assays 0.33 oz. gold and 2.5 oz. silver per ton. Where intersected in the main crosscut, the vein showed a width of 18 ft. At 55 ft. in the north drift an exploratory crosscut showed a width of 14 ft., and at 70 ft. in the south drift was indicated at from 10 to 11 ft.

MEXICO

Labor situation brighter — Hold miners' convention — Supreme Court voids Ploma leases.

★ Mexican mining currently is none too bright, with its prime production, silver, hit hard by a lower price. There is still optimism because of the practical interest in the mining business taken by President Miguel Aleman. The mint is working three shifts, 24 hours daily, producing some 40,000,000 silver pesos, in one and five-peso denominations, at the record rate of about 500,000 daily, which are to be put into circulation in September. Labor is much more reasonable, perhaps because nearly a third of the mines are closed, as well as because of the good will and intensification of the spirit of cooperation the Aleman administration has inspired.

★ Antimony at 35¢ is causing something of a boom, in which many small operators are participating, in Mexico's antimony zones from Durango to Queretaro and in Oaxaca.

★ The biennial convention of the miners union opened in Mexico City on May 2, under the chairmanship of Augustin Guzman V, the union's secretary general. Enrolling mining workers in national social insurance, fomenting mining cooperatives, and arranging a meeting of all mining labor organizations in the Americas to prepare for a sort of continental solidarity of those workers are the prime discussion matters.

★ No further clamors for pay hikes in mining are seen until 1948, as American Smelting, Peñoles, The Fresnillo company, and some Mexican firms granted wage increases recently, and the two-year work contracts do not come up for revision until next year. Raises ranged from 60 centavos (13¢) to 1.91 pesos (37¢) a day. It was

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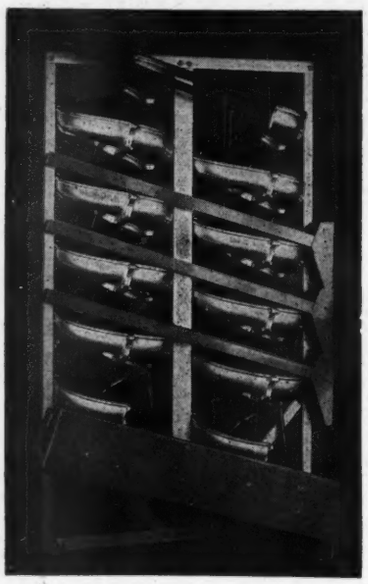

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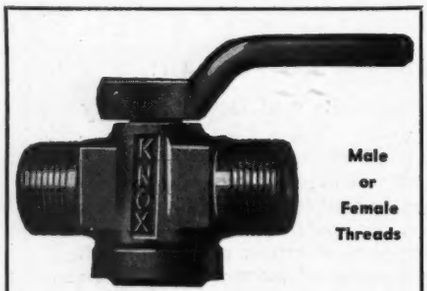

Male
or
Female
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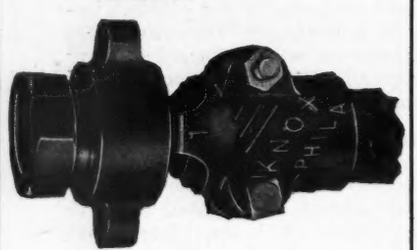

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Mexico (*Continued*)

arranged that the miner's union convention be held one year, and the contract revision the next, thereby assuring a two-year surcease from wage raise demands.

★ Though the Federal Government recently started assisting the cooperative society at Cia. Minera Dos Estrellas, El Oro, State of Mexico, with 600,000 pesos cash ($127,500) and the provision of mining and accounting technicians, there is a movement among the members for "more autonomy" in the enterprise's operation. These members say the cooperative's executives now must take orders from the Government's men, a circumstance the members consider will hamper free operation of the cooperative. President Aleman assigned the technicians and ordered the cash aid rendered when experts he assigned to make a survey of the Dos Estrellas situation reported that the cooperative needed help badly.

★ The Supreme Court set a precedent of importance to mining when it upheld the cancellation by the Ministry of National Economy of concessions to mining tracts taken up by Cia. Minera Plomosa, S. A., and Cia. Minera Internacional, S. A., but on which they had stopped work. The Court agreed with the Ministry's contention that it had cancelled these franchises because work continued on other tracts that have similar ores, although the companies claimed that they were forced to stop work because it was unprofitable. The Court commented that "closure of public wealth at the whim of private operators is contrary to public interest. Mining in Mexico must never be at the caprice of concessionnaires."

CHILE

Delirio to build mill — Dispute looms over Braden profits — New smelter to be built at Paipote

★ Compania Minera Delirio de Punitaqui, after several years of successful exploratory work, is planning to build a 100-ton flotation mill to treat its copper-gold ore, which averages about 4.2% copper and 0.1 oz. of gold per ton. Power for mine and mill will be supplied by diesel engines. The orebodies developed are on the same wide vein but on different claims as the Los Mantos oreshoot, which has been exploited and treated by flotation on a 400-ton basis by Cia. Minera Punitaqui for nearly ten years. Notable difference between the oreshoots of both companies is that Delirio's is much richer in copper, but contains no cinnabar and is poorer in gold.

★ According to the Chilean Labor Code, companies that have legal unions and make profits are compelled to give to the union either 10% of the profits or 6% of the yearly wages paid out. Braden's management this year offered their unions 10% of profits, which had sunk considerably on account of last year's long strike. The men want the company to pay them, as their share of the profits, 6% of the yearly wage. When this was written the company had offered to increase the union's share to $80,000 for the year 1946, but no settlement had yet been reached.

★ Cia. Minera Los Amigos, whose copper mine is near the Til-Til camp, on the Santiago-Valparaiso railroad, has had a loan approved by Caja de Credito Minero in order to build a 75-ton flotation mill to handle the copper ore from its Ramayana mine, whose grade is almost 5% copper. The ore is soft and easily floated.

★ Callaguillos is one of the few gold mines which started during the big crisis of 1932-33, when the price of gold rose several times above its original value of 5.46 pesos per gramme, and has stood the test of time and depth. Though it possesses no mill, since the ores, both high and low grade, are sold to the Mining Bank, the former for export and the latter for concentration in President Aguirre Cerda's mill, the mine has been very well and economically managed and is paying dividends steadily.

★ There seem to be good possibilities that the two French companies that

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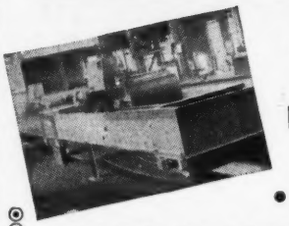

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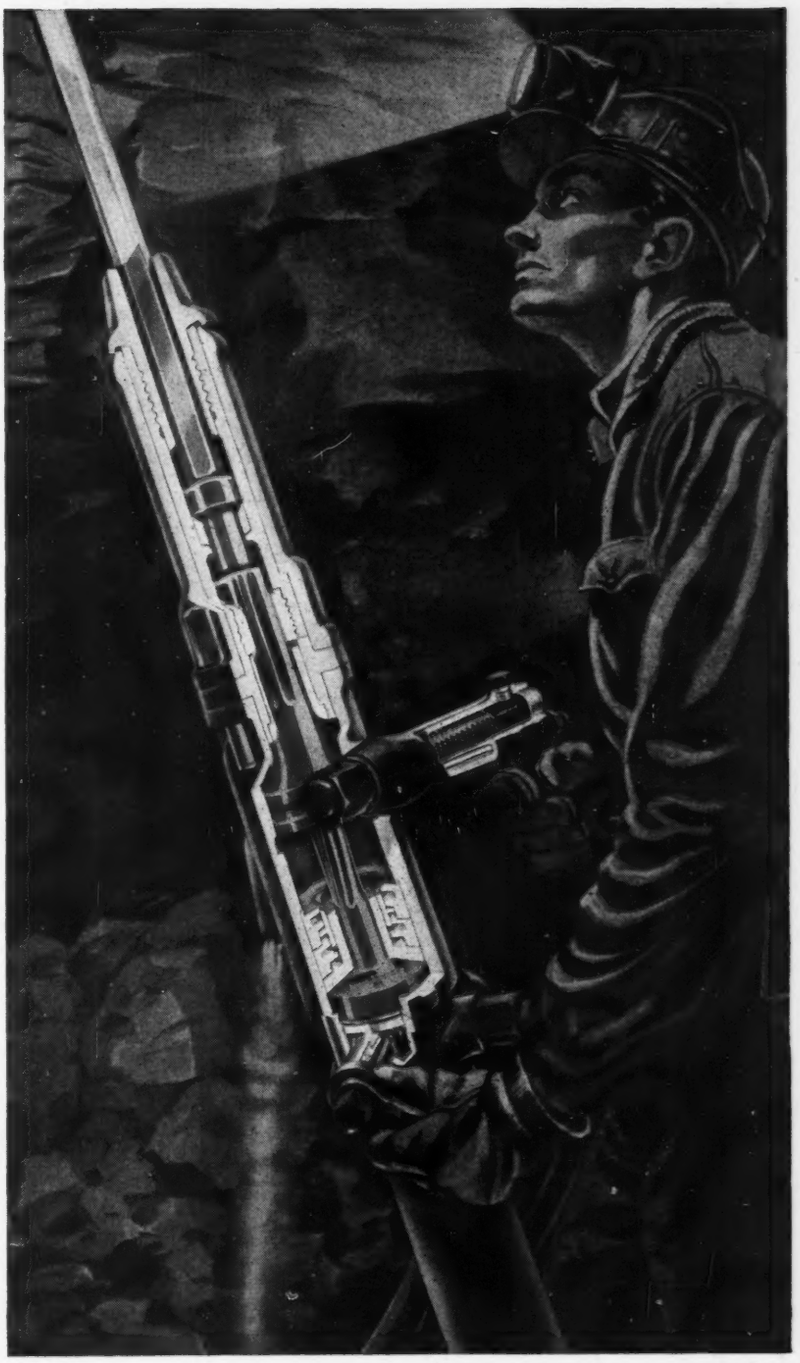

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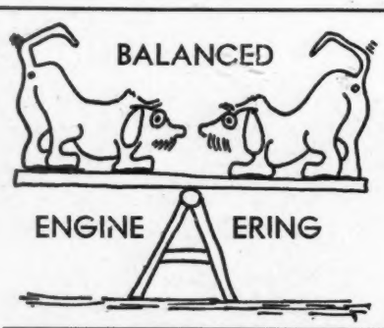

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Chile *(Continued)*

operate in Chile, Cie. Miniere du M'Zaita and Société des Mines de Cuivre de Naltagua, will be merged into one, according to current reports in Santiago. The former owns the Chagres smelter as well as the El Soldado and Cerrado mines and mills in Central Chile, and the latter, the Naltagua smelter, located between Santiago and the port of San Antonio. Main asset of Naltagua today is its control of Cia. Minera Disputada de Las Condes through a subsidiary known as Cia. Auxiliar. Cia. Disputada owns a good copper mine and a 500-ton mill, two ropeways, one of them being 16 miles long, the longest in South America, and four hydroelectric plants on the Mapocho River. The mine is only 40 miles from Santiago.

★ Cia. Minera Punitaqui, the principal gold producer in the country, has just published its annual report, which shows that the company milled 123,462 metric tons of ore during 1946 and produced 2,177 tons of high-grade ore. Production amounted to 664.5 kilograms of fine gold, 457.3 tons of fine copper, and 28,157 kilos of metallic mercury. The total value of the products sold amounted to US$1,170,000 and the profit, after paying taxes, US$200,000.

★ The Council of the Mining Bank has announced in the press its decision to go ahead with the Paipote smelter project. The smelter, which was designed by Allis-Chalmers engineers, will have a capacity of 450 tons of charge per day and will smelt the wet charge in reverberatories. The charge will consist of copper, gold, and silver ores and concentrates produced within a zone that will extend from as far as Tocopilla in the north to Vallenar in the south. The smelter will be at Paipote, near the town of Copaipo, which is the railroad junction of the Longitudinal Railway and the branch line from Caldera to Tres Puentes. According to the released report, the total cost of the smelter with present prices will amount to $4,000,000, of which total about $2,000,000 will be spent in the United States for machinery.

The Paipote smelter is just a part of the two-year plan laid out by the Mining Bank to help the small mining industry, which, besides the smelter, considered the spending of $1,300,000 in developing some of the mines that will furnish ore for the smelter; $1,000,000 for increasing production in the smaller coal mines; another $1,000,000 for developing mines outside the radius of attraction of the smelter, and $320,000 in developing processes for producing metallic salts.

★ The Alemania nitrate plant, located in the Taltal nitrate region, has started operating again with the Shanks process after being down since 1916. It will produce 8,000 tons of

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Chile (*Continued*)

sodium nitrate per month and will employ about 900 workers.

★ The Mining Bank has signed a new contract with the American Smelting & Refining Co. to sell to the latter during another year the whole of its production of copper, gold, and lead concentrates, as well as all the copper, gold, and lead ores bought by the Bank.

★ Because of the great need for increasing production of foodstuffs the world over, there are excellent prospects for the Chilean nitrate industry in the next five years. The actual production capacity of the industry is 1,648,000 metric tons of nitrate per year, of which total 1,100,000 metric tons are produced by the plants which employ the so-called Guggenheim process, Maria Elena, Pedro de Valdivia, and Victoria; and 584,000 metric tons by plants which use the older and less efficient Shanks process. Under present world conditions up to 2,500,000 tons of Chilean nitrate could be sold per year, but the industry is not in a position to supply so much nitrate fertilizer.

PHILIPPINES

Big Wedge results good — Labor trouble at Masinlos — Mindanao Mother Lode re-equipping

★ Big Wedge Mining Co. reports recovery for April of $173,250 from milling 6,313 tons, an average recovery of $27.40 per ton. This compares with an average value of $20.47 per ton for the 11½ months of operation in 1941. The mill feed during these 30 days after the 5½ year shutdown included considerable rejects from the high-grading that went on in the occupation period. The rehabilitated surface plant is reported in excellent condition, but only the first unit of the mill of 250 tons' capacity was operating. The second unit is expected to be ready within 30 days, when production should mount to 400 tons per day. Costs are high, but are expected to become somewhat lower as trucking and timber expense comes down.

★ Consolidated Mines, operating the Masinloc chrome deposit, in Zambales, is hampered with trucking troubles and shipping difficulties, although demand for the ore is excellent. A labor dispute regarding higher pay for the workers is under consideration by the National Labor Board, and a decision is expected soon.

★ Mindanao Mother Lode mine started rehabilitation work a year ago, and it is now believed that the new mill will begin producing in August after long delays in getting equipment. The mill is designed for 200 tons daily capacity using straight flotation. Capacity can be easily doubled by adding another ball mill, classifier, and flotation bank, as the washing plant and the thickener have a 400-ton capacity. Power should be available by late July if no further delays are encountered. The mine's operating staff consists of D. C. McKay, general manager; L. E. Smith, resident manager; R. W. Merwin, mill superintendent; A. H. Crenshaw, mine superintendent; and Waldo Neveling, master mechanic.

AFRICA

First shaft started for Anglo-American's Free State mine — Freddies' two leases approved

★ A further stage was reached on May 16 in the development of the Orange Free State gold field when Sir Ernest Oppenheimer, chairman of Anglo-American Corporation, turned the first sod at the shaft site near Odendaalsrust of the new Welkom Gold Mining Co. This shaft, actually the No. 2 shaft, will strike the Basal Reef at about 2,900 ft., but it will be driven on down to about 4,500 ft. It will be 46x10 ft. in cross-section, concrete-lined throughout. No timber will be used. In proving the area, Anglo-American has driven about 275,000 ft. of diamond-drill hole. In the Orange Free State as a whole, about 1,000,000 ft. of hole has been drilled by all the companies prospecting there.

★ Returns for May operation of Rand mines show, principally, new tonnage and profit records for Blyvooruitzicht. The company treated 40,000 tons in May, against 37,000 tons in April. Profits rose by nearly £10,000 to £196,540 for May. Returns of other mines showed improvement in milling rates all around.

Labor troubles early this year contributed to a record of lower production and higher costs for the first four months of 1947.

★ Free State Development & Investment Co. (Freddies) announced recently that the Mining Leases Board had acted favorably on the company's application for two mining leases in the Orange Free State. The announcement stated that the Government will receive, in return for the leases, a percentage of profits expressed by the formula: $Y = 15 - \frac{90}{X}$. Here, X is the ratio of profit to recovery expressed as a percentage, and Y is the percentage of profit payable to the Government.

★ West Driefontein was able to report 100% payability in 445 ft. of development work during the first quarter of 1947. The value was 59.1 dwt. over 13 in., or 768 in.-dwts.

★ American-African Mining & Exploration Co. announces that the New Belfast mine, in Barberton, began crushing on May 19. The plant was built recently and has a capacity of 2,500 tons a month. Ore from the mine assays as high as 117.2 dwt. over 48 in.

★ Geldenhuis Deep announces that exhaustion of ore reserves makes necessary a halt in mining operations at the company's Nos. 3 and 4 shafts, as of June 1, 1947. General clean-up operations will ensue for a few months, but the end of the property is at hand. Since it began in October 1895 the mine has paid about £4,600,000 in dividends.

★ Frobisher Exploration Co. recently purchased the Connemara-Zabonkwe mine, in the Selukwe district of Southern Rhodesia, and by the end of this year the company expects to be mining about 6,000 tons a month. Reserves are estimated at 580,000 tons of ore running about 5 dwt. in gold.

AUSTRALIA

WESTERN AUSTRALIA

Gold mining outlook seen as gloomy—Low-grade producers in difficulty — Base metals expand

★ Concern is felt in this State at the trend in industrial affairs, and particularly as to the outcome of the claims put forward by the miners' union. The introduction of a 40-hour week in all industries appears inevitable, but it is expected that a 35-hour week will be demanded for underground workers. This will mean an actual effective working time of 25 hours per week. The effect of those hours, plus the extravagant wage claims, will close many of the lower-grade mines—that is, those working ore of an average grade approximating 5 dwt. gold per ton. The outlook for the gold mining industry is, therefore, gloomy.

To the rapidly increasing burdens is added that of taxation. The Commonwealth Government collects by the gold tax one-half of the amount by which the price of gold exceeds £A9 per oz., with provision of a refund of the tax paid by companies whose operations are barely profitable or which are carried on at actual loss. Refunds since 1940 have equaled about 25% of the tax paid in Western Australia.

★ An interesting development has been reported on the property of Central Norseman Gold Corporation, in which Western Mining Corporation is largely interested. From a crosscut at No. 22 level, a traverse of four diamond drill holes intersected the reef at greater depth. At 160 ft. below the level, the reef assayed 11.1 dwt. gold per ton over a width of 65 in.; at 270 ft., 10.6 dwt. over 48 in.; at 380 ft., 6.2 dwt. over 43 in.; and at 670 ft. the core assayed 1.0 dwt. over

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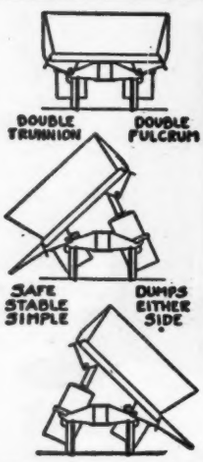

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Australia (*Continued*)

width of 60 in. Winzing is in progress to develop the values disclosed.

SOUTH AUSTRALIA

★ Important expansion of operations by the Broken Hill Associated Smelters, at Port Pirie is probable. Following long investigations, it is reported that the company proposes to treat the slag dumps for the recovery of zinc. The estimated content of the dumps is 1,000,000 tons of zinc, and recovery will be at the rate of 30,000 tons of metallic zinc per annum.

NEW SOUTH WALES

★ The more distant future of the Broken Hill silver-lead-zinc field lies in the extension of the lode, at depth, to the north and south. In the New Broken Hill Consolidated, Ltd., property, which adjoins the Zinc Corporation mine on the south, the ore-bearing horizon lies below a depth of 1,700 ft. from surface. A recent diamond drill bore, put down from surface, about two-thirds of a mile south of the southern boundary of the Zinc Corporation mine, at a vertical depth of 1,800 ft., passed out of mineralized quartzite into ore at an inclined depth of 2,432 ft. The section disclosed in the bore was: from 2,432 ft. to 2,436 ft. the core assayed 26.2% lead; 12.8 oz. silver; and 14.3% zinc; from 2,436 ft. to 2,439 ft., 0.9% lead; 0.4 oz. silver; 0.9% zinc.

TASMANIA

★ Mount Lyell Mining and Railway Co., Ltd., on the west coast of Tasmania, is increasing mining and milling plant with the object of expanding production from 4,200 tons to 5,000 tons per day. Proved reserves of open-cut ore have been increased from 14,000,000 to 35,000,000 tons with an average assay value of 0.77% copper, 0.05 oz. silver and 0.0084 oz. gold. In the past year, the mill treated 1,468,825 tons of ore for the recovery of 34,009 tons of copper concentrate, assaying 23.71% copper; and 54,672 tons of pyrite concentrate, assaying 50.09% sulphur. The blast furnace produced 8,203 tons of blister copper and the electrolytic refinery produced 7,972 tons of cathode copper. Despatch of products has been greatly restricted by shortage of shipping and accumulated pyrite concentrate now amounts to 137,000 tons awaiting transport to mainland manufacturers. The shipping shortage is also making difficult the securing of adequate supplies of coal and coke, and is adding to the difficulties of construction, already hampered by shortage of labor and materials. Ore mined in the open cut is transported to a transfer pass leading to the North Lyell tunnel, 7,000 ft. long, leading to the concentration plant.